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United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture
Forest Service
and the Arkansas
Agricultural
Experiment Station

Soil Survey of Madison County Arkansas

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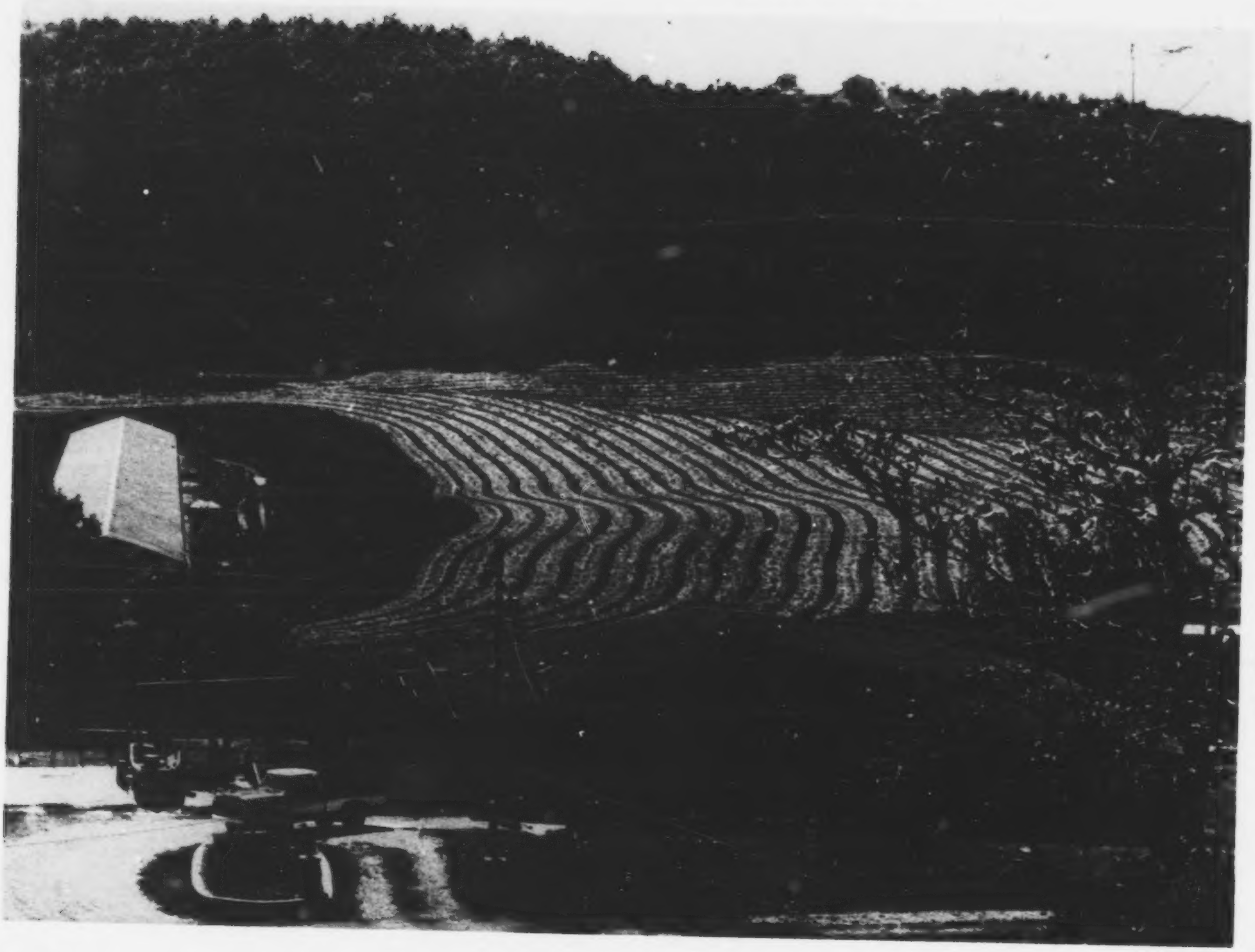

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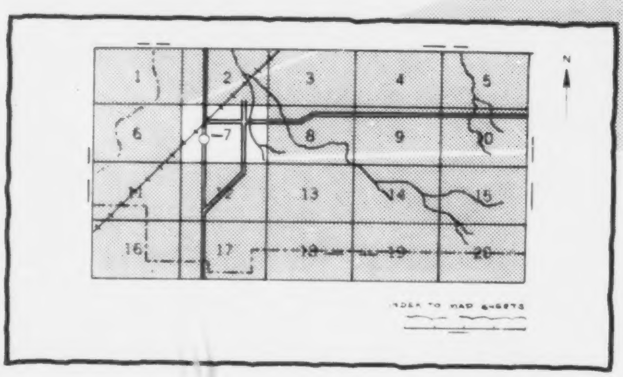
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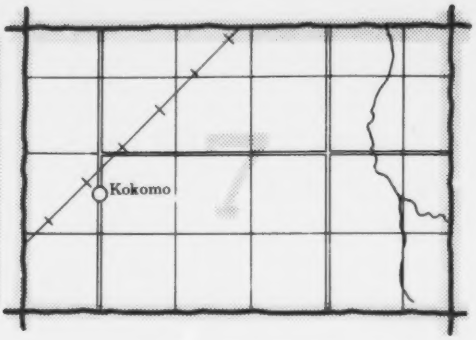

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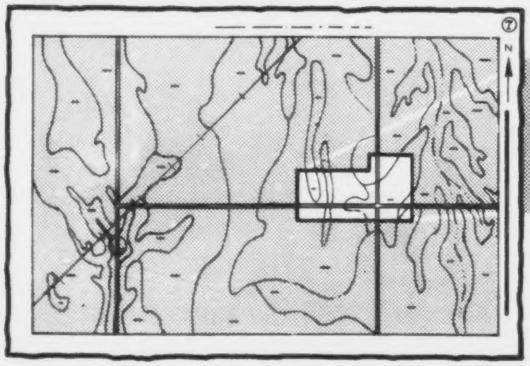

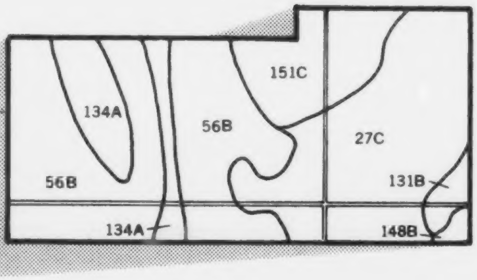
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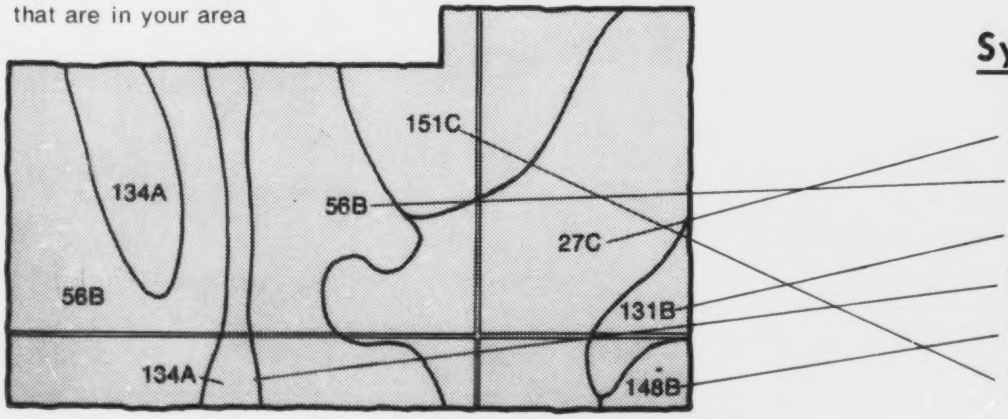
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IS SOIL SURVEY

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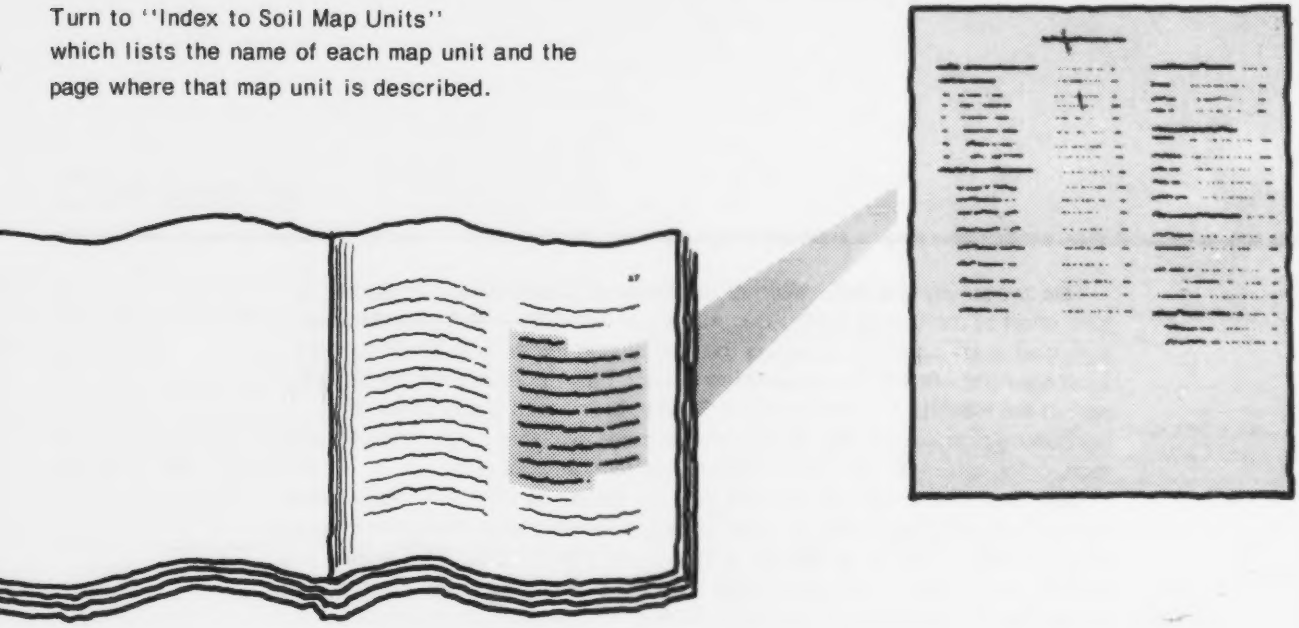
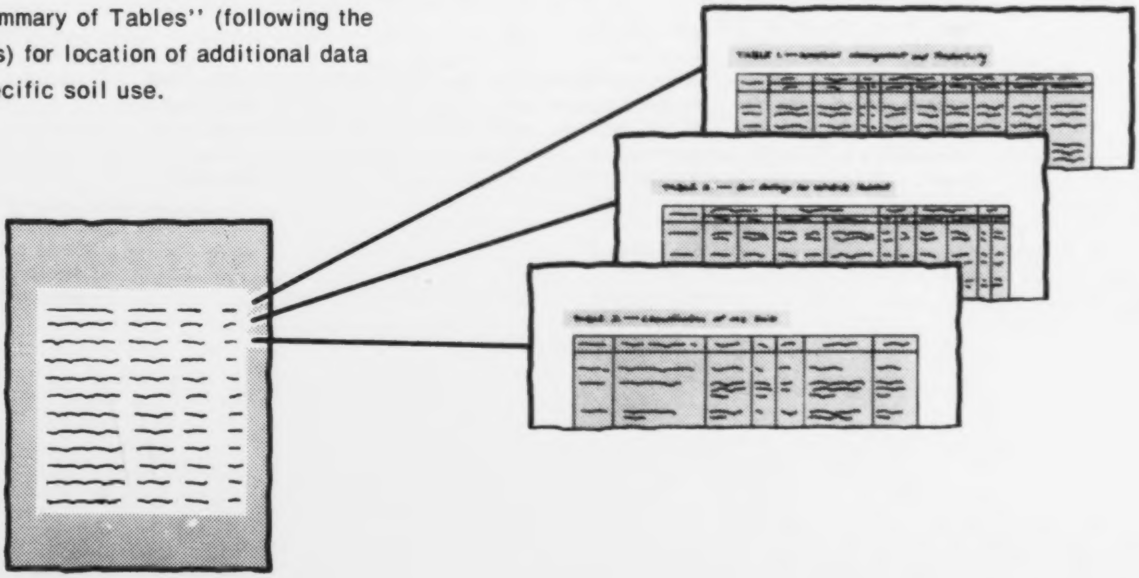


See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Madison County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Farms in Madison County typically combine poultry production with raising beef cattle or with dairying. The soils in the pasture and hayland, where a crop of fescue and white clover has been mown for hay, are Nella gravelly loam, 8 to 12 percent slopes, and Allen loam, 3 to 8 percent slopes. The soils on the rolling and steep wooded hills are Enders-Leesburg stony loams. (*Photo by Dan Toomey, photographer, Huntsville, Arkansas.*)

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Foreword

This soil survey contains information that can be used in land-planning programs in Madison County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Jack C. Davis

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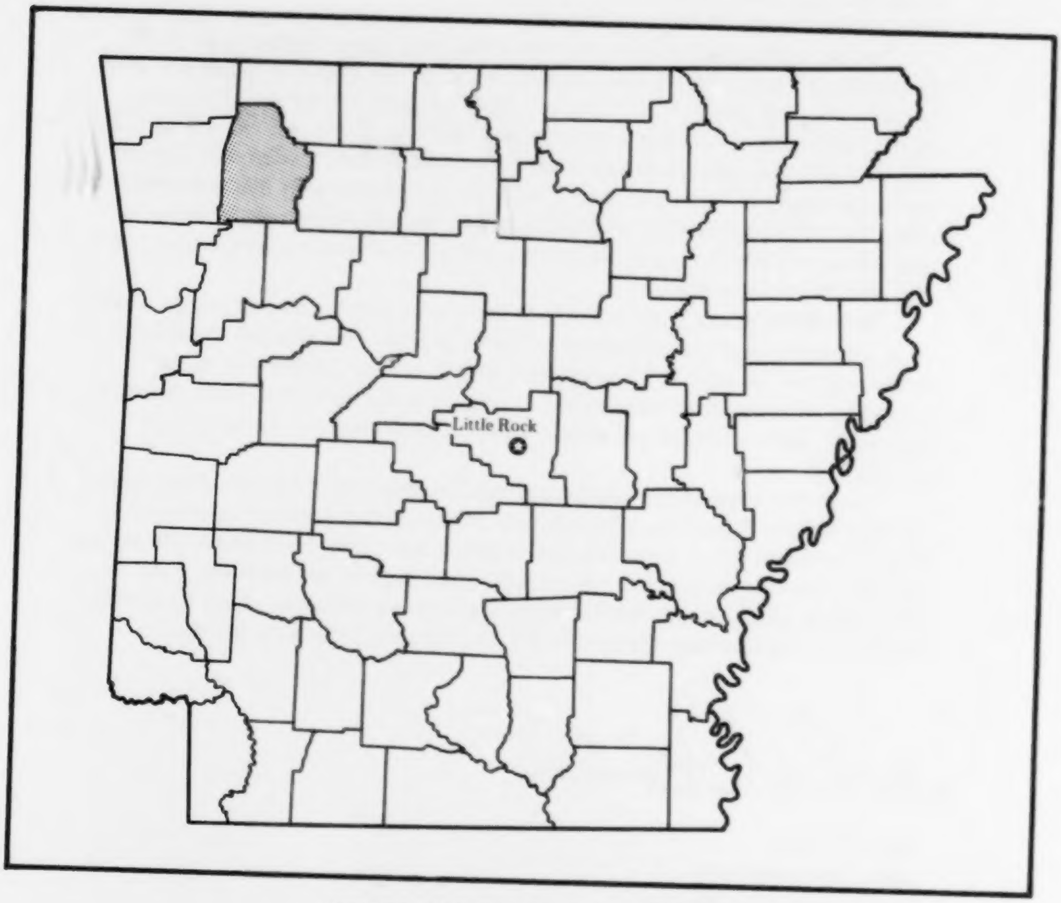
State Conservationist
Soil Conservation Service


Little Rock

Location of Madison County in Arkansas.

Soil Survey of
Madison County, Arkansas

By Wallace Phillips, Soil Conservation Service

Fieldwork by Wallace Phillips, David H. Fowlkes, and Richard T. McCright,
Soil Conservation Service

United States Department of Agriculture
Soil Conservation Service and Forest Service,
In cooperation with
the Arkansas Agricultural Experiment Station

MADISON COUNTY is in the northwestern part of Arkansas. The county is irregularly rectangular in shape and extends 38 miles from north to south and 22 miles from east to west. It is bordered by Washington and Benton Counties on the west and by Carroll County on the north and northeast, where Kings River forms part of the common boundary. On the east it is bordered by Newton County and on the south by Johnson, Franklin, and Crawford Counties. The total area of the county is 535,981 acres, or 837 square miles.

In 1980, the population of the county was 11,373. Huntsville is the county seat and the main trade center. It had a population of 1,394 in 1980. St. Paul and Kingston are the towns next in size, and there are several smaller communities.

The economy is based to a great extent on beef cattle and poultry production, dairying, and forestry.

General Nature of the County

This section gives general information about Madison County. It discusses farming and land use, physiography and drainage, and climate.

Farming and Land Use

Before the first European settlement in what is now Madison County, Indians lived in bluff shelters and along the creeks and rivers. They hunted, fished, gathered food from wild plants and trees, and cultivated small food plots.

The first European settlers arrived in the area around 1830 (*8*). They cleared and farmed small scattered areas of land on flood plains, terraces, and gently sloping uplands where the soil was deep and had little gravel and few stones. As roads were built and markets were developed, more of the flood plains and the gently sloping uplands were cleared. Corn and small grains, livestock, and other farm products were produced for sale. The settlers also cut and sold the virgin hardwood timber. Hogs and cattle were ranged in the woods and the unfenced open areas.

As the rural population grew, steeper and commonly less productive land was cleared, cultivated, and planted with a variety of row and truck crops. In many areas cultivation was followed by excessive soil erosion.

The population of Madison County peaked in the period from 1890 to 1900 (*3*) and began to decline. However, the clearing and cultivation of new fields continued into the 1930's. From the 1930's through the 1950's, many farms were abandoned or consolidated, and the rural population of the county decreased rapidly. Soil erosion came to be recognized as a major problem. On many farms, land use changed from cultivated crops to pasture or hayland.

During the 1950's the livestock industry became more commercialized. Confined poultry production became an established industry. More recently, a few large confinement swine operations have been set up. In the latter part of the 1950's the acreage of improved pasture continued to increase. Woodland was again cleared for use as pasture in the 1960's and 1970's, a trend which is still continuing.

At the present time Madison County is part of a major poultry-producing area. Raising broiler chickens is the main enterprise, but egg production and turkey production are also important. Poultry litter and manure is a valuable by-product of the poultry industry. Most of it is spread on pasture and hayland in the county each year.

Beef cattle production has increased in recent years. Most farms have a cow-calf operation and sell the calves as feeders or stockers. In general, beef cattle are grazed on cool- and warm-season pasture and ordinarily are given supplemental feeding only in winter.

Dairying is also important. The total number of dairy cattle has decreased from the early 1960's, but milk production per cow has increased. Dairy herds are becoming fewer and larger.

According to the 1978 U.S. Census of Agriculture (*9*) and the Crop Reporting Service (*5*), the number and principal kinds of livestock and the yearly production of poultry in Madison County in 1978 and 1981 were as follows:

	1978	1981
Cattle and calves	51,996	67,900
Milk cows	3,754	4,000
Chickens, broilers	33,284,000	42,832,000
Turkeys	488,000	875,000

The abundance of woodland affected the settlers' mode of living. Early settlers built log cabins and used oak rails for fences. Mast from the trees furnished food for free-ranging hogs as well as for the wildlife the settlers hunted. Later, cutting the timber provided employment and income for many people. By the 1930's, almost all the virgin timber had been cut. The timber industry has declined, but it is still important.

Forests cover about two-thirds of the county. Trees are mainly hardwoods, although there are stands of pine in some areas. For the most part the forests are on the steep, stony, very cherty, or shallow soils. Many stands contain a high proportion of cull, low-grade, or young trees. Some soils have a low site index for commercial forest.

Most of the hardwood timber is sold locally and sawed into railroad ties, lumber, barrel staves, furniture stock, and pallet lumber. Pine is harvested in lesser quantities. It is sawed into lumber at local mills. A small amount of walnut and quality hardwoods is sold for veneer stock or high-grade furniture. Black locust and redcedar are used locally for fenceposts.

In 1978, about 45 percent of the land in Madison County was farmed. The number of farms was 1,133, and the average size was 215 acres. More than 80 percent of the farmers were full owners of the land they worked, and most of the rest were part owners. Most of the farms were family operations and employed outside labor only part of the time. However, farming was the main occupation of only about 58 percent of the farmers. Many farmers have part-time or full-time jobs off the farm, and some are retired. Many people in the county live on small acreages which they farm as a hobby.

The rest of the land in Madison County is mainly timberland, urban and built-up land and roads, and in miscellaneous uses. About 9 percent of the county, or 47,861 acres, is part of the Ozark National Forest and is federally owned. About 2 percent is in the Madison County Wildlife Management Area and is owned by the state.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Huntsville, Arkansas, in the period 1964 to 1979. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 38 degrees F, and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Huntsville on January 11, 1977, is -14 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred at Huntsville on August 4, 1964, is 105 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 44 inches. Of this, 25 inches, or about 57 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 4.67 inches at Huntsville on December 6, 1975. Thunderstorms occur on about 60 days each year, and most occur in summer.

The average seasonal snowfall is 15 inches. The greatest snow depth at any one time during the period of record was 13 inches. On an average of 11 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 9 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses.

Each map unit is rated for cultivated crops, pasture crops, woodland, and urban uses. Cultivated crops are those grown extensively in the survey area. Pasture crops are those grown for livestock forage production. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments.

1. Nella-Steprock-Mountainburg

Deep, moderately deep, and shallow, gently sloping to very steep, well drained, gravelly, stony, and very stony soils that formed in colluvium and residuum of sandstone and small amounts of siltstone and shale

These soils are in the southern part of the county, in the Boston Mountains. The soils are on mountainsides that are predominantly steep and wooded. The mountainsides are characterized by bench and bluff topography, which consists of a series of narrow, sloping benches lying parallel to the contour and steep slopes from one bench to the next. Nearly vertical sandstone bluffs commonly are a minor but prominent feature of the landscape. The mountaintops are about 2,000 to 2,300 feet above sea level. The areas are strongly dissected, and drainage converges into narrow valleys.

This map unit makes up about 19 percent of the county. It consists of about 35 percent Nella soils, 30 percent Steprock soils, 20 percent Mountainburg soils, and 15 percent soils of minor extent.

Nella soils are deep. They are moderately sloping and moderately steep on benches and steep and very steep in positions where colluvium accumulates on mountainsides. They have a surface layer of dark brown very stony loam, stony loam, or gravelly loam and a subsurface layer of brown cobbly loam. The subsoil is yellowish red cobbly loam, yellowish red cobbly clay loam, and red cobbly clay loam.

Steprock soils are moderately deep. They are gently sloping to moderately sloping on ridges and steep and very steep on mountainsides. They have a surface layer of brown very stony loam, stony loam, or gravelly loam and a subsurface layer of yellowish brown very stony loam. The subsoil is yellowish red very gravelly loam, yellowish red very gravelly clay loam, and red, mottled very stony clay loam. It overlies soft, thin-bedded sandstone bedrock.

Mountainburg soils are shallow. They are gently sloping to moderately steep on hilltops and steep to very steep on the sides of ridges, hills, and mountains. They have a surface layer of dark brown very stony loam, stony loam, or gravelly loam and a subsurface layer of brown stony loam. The subsoil is yellowish brown very gravelly loam. It overlies hard, level-bedded sandstone bedrock.

The minor soils are the gently sloping to steep Enders and Leesburg soils on mountainsides and benches and the level to nearly level Ceda soils on flood plains in narrow valleys. Small areas of sandstone outcrop and some nearly vertical bluffs are included in the areas of this map unit.

The native vegetation in areas of this map unit was mixed hardwood forest. In some areas of Mountainburg soils on southern exposures, the stand of trees was open, and there was a ground cover of native herbaceous plants and grasses in small openings.

The soils are still predominantly wooded. Farms are few and scattered. The benches and ridgetops that have fairly smooth slopes generally have been cleared and are now mainly in pasture. A large area in the extreme southern part of the county is part of the Ozark National Forest. Part of this area has been planted to pines.

Roads are few. They generally are unimproved and carry little traffic. They follow the ridges or mountaintops

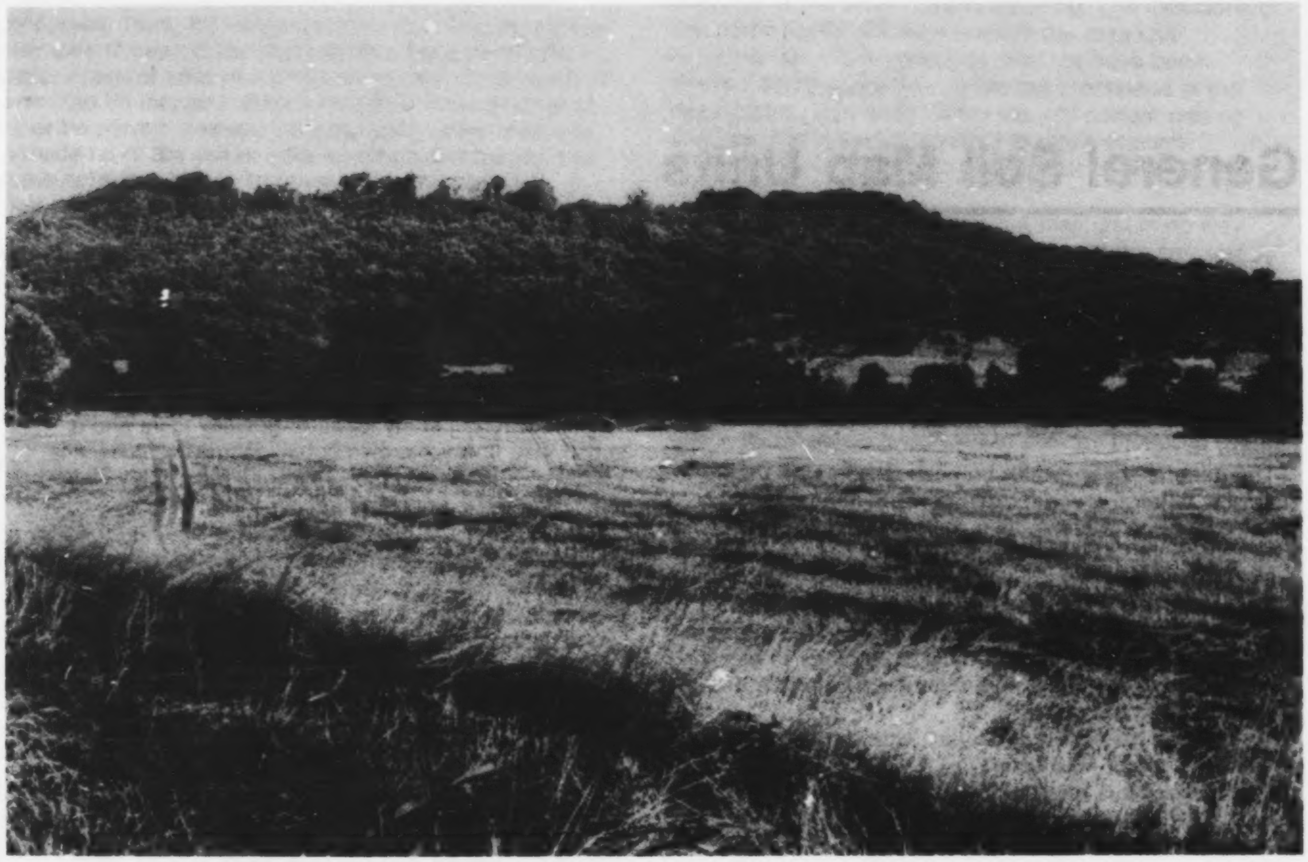


Figure 1.—The area in the foreground is in the Tonti-Peridge-Captina association. Soils of the Enders-Leesburg association are on the slopes in the background.

or run along the smoother benches and through the narrow valleys.

Water for livestock and wildlife is furnished by farm ponds, small streams, and a few springs. Individual wells supply water for most households.

The soils generally are not suited to cultivated crops. In a few small areas they are poorly suited. Stones on the surface, the steepness of the slope, and shallowness to bedrock are the main limitations.

The soils are mainly poorly suited or not suited to use as pasture and are not suited to hayland. In some areas the soils are gently sloping and are well suited to moderately suited to use as pasture. Slope and stones are the main limitations on the Nella and Steprock soils. Shallowness to bedrock, slope, and stones are the main limitations on the Mountainburg soils.

The Nella soils on north- and east-facing slopes are well suited to use as woodland, and those on south- and west-facing slopes are moderately suited. Steprock soils on north- and east-facing slopes are moderately suited to use as woodland, and those on south- and west-facing slopes are poorly suited. Mountainburg soils are poorly suited. In some areas, the steepness of the slope is a moderate to severe limitation to the use of equipment. This limitation is a major hindrance in managing woodland and harvesting timber.

Nella soils are moderately suited to poorly suited to most urban uses, depending on the slope. Slope and stones on the surface are the main limitations. Steprock and Mountainburg soils are mainly poorly suited to most urban uses. Slope, depth to bedrock, and stones are the main limitations.

2. Tonti-Peridge-Captina

Deep, nearly level to gently sloping, moderately well drained and well drained, loamy and cherty soils that *formed in loamy and cherty material*

These soils are in two areas in the northwestern part of the county. The larger area is in the vicinity of Hindsville, and the other is near Clifty. The soils are on broad uplands of the Springfield Plateau (fig. 1). Slopes range from 1 to 8 percent.

This map unit makes up about 2 percent of the county. It consists of about 40 percent Tonti soils, 35 percent Peridge soils, 18 percent Captina soils, and about 7 percent soils of minor extent.

Tonti soils are moderately well drained and are gently sloping. They are on uplands. They have a surface layer of dark brown cherty silt loam. The upper part of the subsoil is yellowish brown cherty silt loam and yellowish brown cherty silty clay loam. Below that, there is a firm and brittle fragipan that is yellowish brown, mottled very cherty silt loam. The lower part of the subsoil, below the fragipan, is yellowish red, mottled extremely cherty clay and red, mottled extremely cherty clay.

Peridge soils are well drained and are nearly level to gently sloping. They are on uplands. They have a surface layer of dark brown silt loam. The subsoil is yellowish red silt loam; red silty clay loam; red, mottled silty clay loam; and yellowish red, mottled silty clay loam.

Captina soils are moderately well drained and are nearly level. They are on broad uplands. They have a surface layer of dark brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part over a compact and brittle fragipan that is mottled in yellowish brown and light brownish gray. The fragipan is silty clay loam in the upper part and very cherty silty clay loam in the lower part. The lower part of the subsoil, below the fragipan, is red, mottled extremely cherty clay.

The minor soils in this map unit are the very cherty Nixa, Noark, and Clarksville soils on narrow ridges and the steeper part of side slopes and the somewhat poorly drained Johnsburg soils in depressions.

The native vegetation on the soils was mixed hardwoods. Practically all the acreage has been cleared except small areas of minor soils. In most places the soils are used as pasture and hayland. In some areas they are in cultivated crops, such as forage crops, small grains, and soybeans.

Roads, farmsteads, and farm buildings occupy a small part of the acreage.

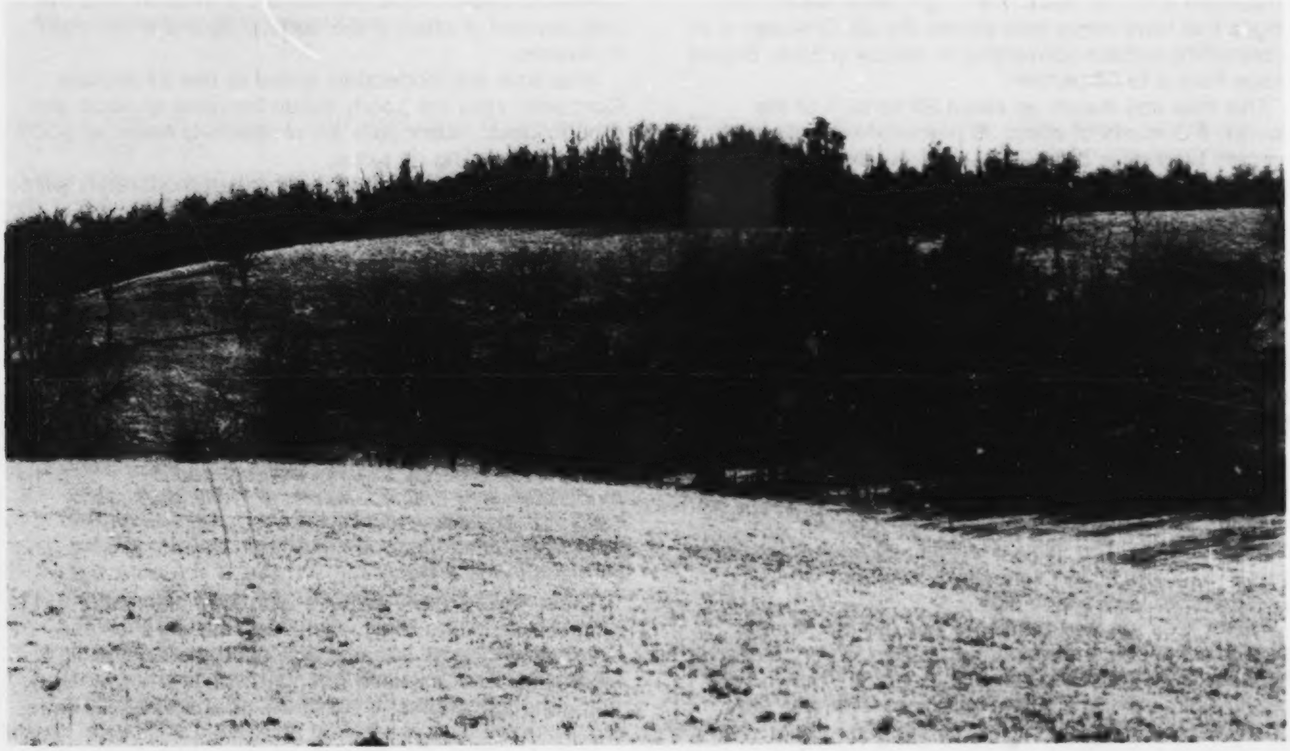


Figure 2.—Typical topography of the Nixa-Clarksville-Noark association.

Water for livestock commonly is supplied from farm ponds or wells. Water for household purposes and confinement livestock operations commonly is furnished by individual wells and rural water systems.

Tonti soils are moderately suited to cultivated crops, Peridge soils are well suited to moderately suited, and Captina soils are well suited.

Tonti, Peridge, and Captina soils are well suited to use as pasture and hayland, and they are used mainly for hay and pasture.

Tonti and Captina soils are moderately suited to use as woodland, and Peridge soils are well suited.

Tonti soils are mainly moderately suited to most urban uses, and Captina soils are moderately suited to poorly suited. Wetness and the slow permeability are the main limitations. Peridge soils are well suited to moderately suited to most urban uses.

3. Nixa-Clarksville-Noark

Deep, gently sloping to very steep, moderately well drained, somewhat excessively drained, and well drained, very cherty soils that formed in residuum of cherty limestone

These soils are in the northern part of the county on ridges and hillsides of the Springfield Plateau. This landscape is characterized by long, narrow, branched ridges that have steep side slopes (fig. 2). Drainage is in a branching pattern converging in narrow valleys. Slopes range from 3 to 50 percent.

This map unit makes up about 20 percent of the county. It consists of about 35 percent Nixa soils, 30 percent Clarksville soils, 24 percent Noark soils, and 11 percent soils of minor extent.

Nixa soils are moderately well drained. They are gently sloping and moderately sloping and are on ridgetops on uplands. They have a surface layer of dark grayish brown very cherty silt loam. The subsurface layer is brown very cherty silt loam. The upper part of the subsoil is light yellowish brown very cherty silt loam. Below that, there is a yellowish brown, mottled extremely cherty silt loam fragipan; below the fragipan, the lower part of the subsoil is red, mottled extremely cherty clay.

Clarksville soils are somewhat excessively drained. They are steep and very steep and are on hillsides. They have a surface layer of dark grayish brown very cherty silt loam and a subsurface layer of pale brown very cherty silt loam. The subsoil is light yellowish brown very cherty silt loam, brown very cherty silt loam, and yellowish red very cherty clay.

Noark soils are well drained. They are moderately sloping on ridges and moderately steep to very steep on hillsides. They have a surface layer of dark brown very cherty silt loam and a subsurface layer of brown very cherty silt loam. The subsoil is strong brown very cherty silt loam; yellowish red very cherty clay; and dark red very cherty clay.

The minor soils are Elsah, Moko, Tonti, Secesh, and Waben soils. The very cherty Elsah soils and the gravelly Secesh soils are on narrow flood plains and are occasionally flooded. The very stony Moko soils are on the lower part of side slopes near limestone outcrops. The cherty Tonti soils are on smoother parts of upland ridges. Waben soils are on alluvial fans and terraces.

The native vegetation in areas of this map unit was originally hardwood trees or mixed hardwoods and pine. Many ridgetops have been cleared as well as some side slopes; these areas are used mainly as improved pasture. Only a small acreage is in cultivated crops. Some areas in the northeastern part of the county are in public ownership and are managed mainly as habitat for wildlife or for recreation uses.

Farmsteads and farm buildings are scattered, and most of the farmsteads are on ridgetops. Roads generally run along ridgetops or through narrow valleys of included soils.

Water for livestock is obtained from farm ponds, small streams, springs, or wells. In some areas a rural water system supplies water for households and confinement livestock operations.

Nixa soils are moderately suited to poorly suited to cultivated crops. Clarksville soils are not suited, and Noark soils are poorly suited or are not suited to cultivated crops. Slope, the hazard of erosion, and the high content of chert in the surface layer are the main limitations.

Nixa soils are moderately suited to use as pasture. Clarksville soils are poorly suited because of slope and droughtiness. Noark soils are moderately suited or poorly suited, depending on slope.

Nixa, Clarksville, and Noark soils are moderately suited to use as woodland.

Nixa soils are well suited to poorly suited to most urban uses. The slow permeability in the subsoil and slope are the main limitations. Clarksville soils are poorly suited to most urban uses because of slope. Noark soils are moderately suited or poorly suited to most urban uses, depending on slope.

4. Ceda-Leadvale-Cleora

Deep, level to gently sloping, well drained and moderately well drained, loamy, gravelly, and cobbly soils that formed in alluvium derived mainly from sandstone, siltstone, and shale or in colluvium from sandstone and shale

These soils are on terraces and flood plains along Kings River, White River, War Eagle Creek, Richland Creek, and smaller streams that drain the Boston Mountains. The soils are in long, relatively narrow areas that generally are less than three-fourths of a mile wide (fig. 3).

This map unit makes up about 5 percent of the county. It consists of about 30 percent Ceda soils, 20 percent

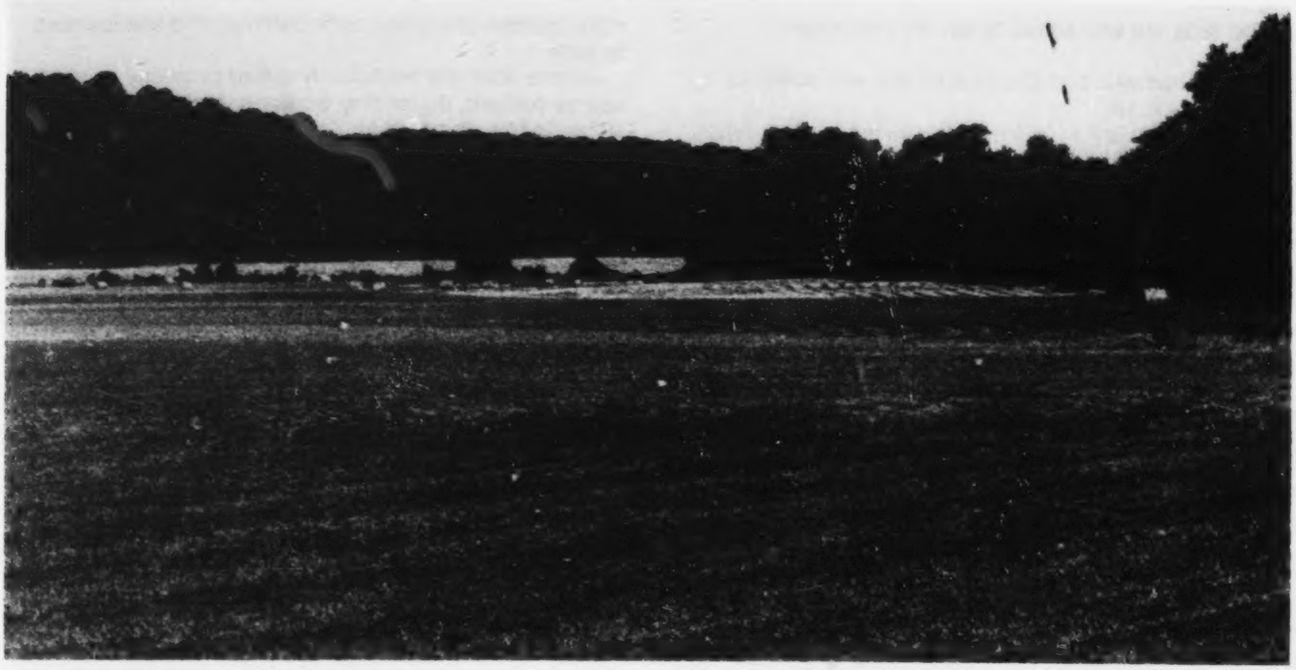


Figure 3.—Hay has been cut and baled in this field, which is in one of the broader sections of the Kings River Valley. The valley is part of the Ceda-Leadvale-Cleora association.

Leadvale soils, 18 percent Cleora soils, and 32 percent soils of minor extent.

Ceda soils are well drained and are level and nearly level. They are on flood plains of smaller tributary streams and are adjacent to the channel. These soils are occasionally or frequently flooded. They have a surface layer of dark brown gravelly fine sandy loam or cobbly fine sandy loam. The subsurface layer is dark brown gravelly fine sandy loam. The underlying material is dark brown very gravelly fine sandy loam and brown very gravelly loam.

Leadvale soils are moderately well drained and are gently sloping. They are on stream terraces and colluvial foot slopes. They have a surface layer of dark brown loam. The upper part of the subsoil is yellowish brown loam. Below that, there is a mottled, yellowish brown and strong brown, compact and brittle loam fragipan. Below the fragipan there is a layer of mottled light gray and strong brown clay loam. The lowermost part of the subsoil is mottled, light gray clay.

Cleora soils are well drained and are level and nearly level. They are on flood plains, and they are occasionally flooded. They have a dark brown fine sandy loam surface layer. The underlying material is dark brown sandy loam, fine sandy loam, and stratified sandy loam and sand.

The minor soils are Healing, Allen, Nella, Johnsburg, and Leesburg soils. Healing soils are on low terraces and are rarely flooded. Allen, Nella, Johnsburg, and Leesburg soils are on terraces and the adjacent foot slopes. Also included are some areas of overflow channels.

The native vegetation in areas of this map unit was mixed hardwood forest. Practically all the areas have been cleared except for narrow strips along streambanks. In some areas the soils are used for a variety of cultivated crops, but in most areas they are used for hay and pasture.

Farmsteads and farm buildings generally are situated on the terraces above the flood plain; so also are most of the roads.

Water for livestock is furnished by streams and farm ponds. In some areas there is a rural water system for household use and for confinement livestock operations. In places, water from streams is used for irrigating crops and pasture.

Ceda soils are poorly suited to cultivated crops because flooding is a hazard and the available water capacity is low. Leadvale soils are only moderately suited to cultivated crops because erosion is a severe hazard. Cleora soils are well suited to cultivated crops.

The soils are well suited to use as pasture and hayland.

Ceda, Leadvale, and Cleora soils are well suited to use as woodland.

Ceda and Cleora soils are poorly suited to most urban uses because of flooding. Major flood control measures are needed to overcome this limitation. Leadvale soils are moderately suited to most urban uses. Wetness and slow permeability are the main limitations.

5. Arkana-Moko

Moderately deep and shallow, moderately sloping to steep, well drained, very cherty and very stony soils that formed in residuum of limestone and dolomitic limestone

This map unit is confined to one area in the northeastern part of the county. The soils are on hillsides and foot slopes on the Salem Plateau. This area is characterized by a series of very narrow bands of limestone outcrop, which commonly gives the landscape a distinctive stepped appearance.

This map unit makes up about 1 percent of the county. It consists of about 46 percent Arkana soils, 42 percent Moko soils, and about 12 percent soils of minor extent.

Arkana and Moko soils are intermingled on the same landscape or occur separately.

Arkana soils are moderately deep. They have a surface layer of very dark grayish brown very cherty silt loam. The subsoil is reddish brown cherty clay; yellowish red cherty clay; and brown, mottled clay. The depth to hard limestone is about 32 inches.

Moko soils are shallow. They have a surface layer of very dark grayish brown very stony silt loam and a subsurface layer of dark brown very stony silt loam. The depth to hard limestone is about 10 inches.

The minor soils are the Clarksville, Elsah, and Secesh soils. The very cherty Clarksville soils are on hillsides at higher elevations. Elsah and Secesh soils are on narrow flood plains. Also included are long, narrow bands of rock outcrop and small areas where the slopes are steeper than 40 percent.

The native vegetation was mixed low-grade hardwoods and redcedar. The shallow, rocky soils were mainly in redcedar and a cover of native herbaceous plants and grasses in small openings. These areas are locally called cedar glades. Less sloping Arkana soils were formerly cleared and cultivated. Some less sloping soils are used as pasture or rangeland. About half of the acreage is in public ownership and is managed as habitat for wildlife or for public recreation.

There are only a few scattered farmsteads and public roads.

Water for livestock and wildlife comes from springs, which are fairly common in the area, small streams, and a few ponds or from the Kings River nearby.

The soils are not suited to cultivated crops because of slope, the very severe hazard of erosion, and, on Moko soils, surface stoniness, rock outcrop, and shallowness to rock.

Arkana soils are moderately suited or poorly suited to use as pasture, depending on slope. Moko soils are not suited to use as pasture.

The soils are poorly suited to use as commercial woodland.

The soils in this map unit are poorly suited to most urban uses. On the Arkana soils, slope, the shrink-swell potential, and depth to bedrock are the main limitations. On the Moko soils, shallowness to bedrock, slope, stones, and rock outcrop are severe limitations.

6. Enders-Leesburg

Deep, gently sloping to steep, well drained, stony and gravelly soils that formed in residuum of acid shale and in colluvium from acid shale and sandstone

These soils are in the southern two-thirds of the county. They are on mountainsides, ridges, and hillsides in the Boston Mountains. This map unit is characterized by rolling to steep mountainsides and hillsides with narrow ridges and narrow valleys (fig. 4). In some places there are narrow benches on the mountainsides and steeper slopes between the benches.

This map unit makes up about 50 percent of the county. It consists of about 45 percent Enders soils, 34 percent Leesburg soils, and 21 percent soils of minor extent.

Enders and Leesburg soils are well drained. The soils generally have surface stones, but in some areas they are gravelly.

Enders soils have a very dark grayish brown stony loam or gravelly loam surface layer and a dark brown stony loam subsurface layer. The subsoil is strong brown gravelly loam; red clay; mottled red and light gray clay; and mottled yellowish brown and light gray shaly silty clay. Below this is shale bedrock.

Leesburg soils have a dark brown stony loam or gravelly loam surface layer. The subsurface layer is yellowish brown stony loam. The next layer is yellowish brown gravelly loam. The subsoil is strong brown gravelly clay loam in the upper part; below that, it is mottled strong brown, yellowish red, and pale brown gravelly clay loam and mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay. The lowermost part of the subsoil is mottled yellowish brown, yellowish red, and light gray gravelly clay.

The minor soils are Ceda, Linker, Mountainburg, Nella, and Steprock soils. Ceda soils are on narrow flood plains. The gently sloping Linker soils are on broader ridgetops. Steprock soils and Mountainburg soils are on narrow ridges and side slopes. Nella soils are on benches and side slopes. There are also minor areas of sandstone outcrop and bluffs.

The native vegetation on these soils was mixed upland hardwoods. Some areas of Enders soils on southern

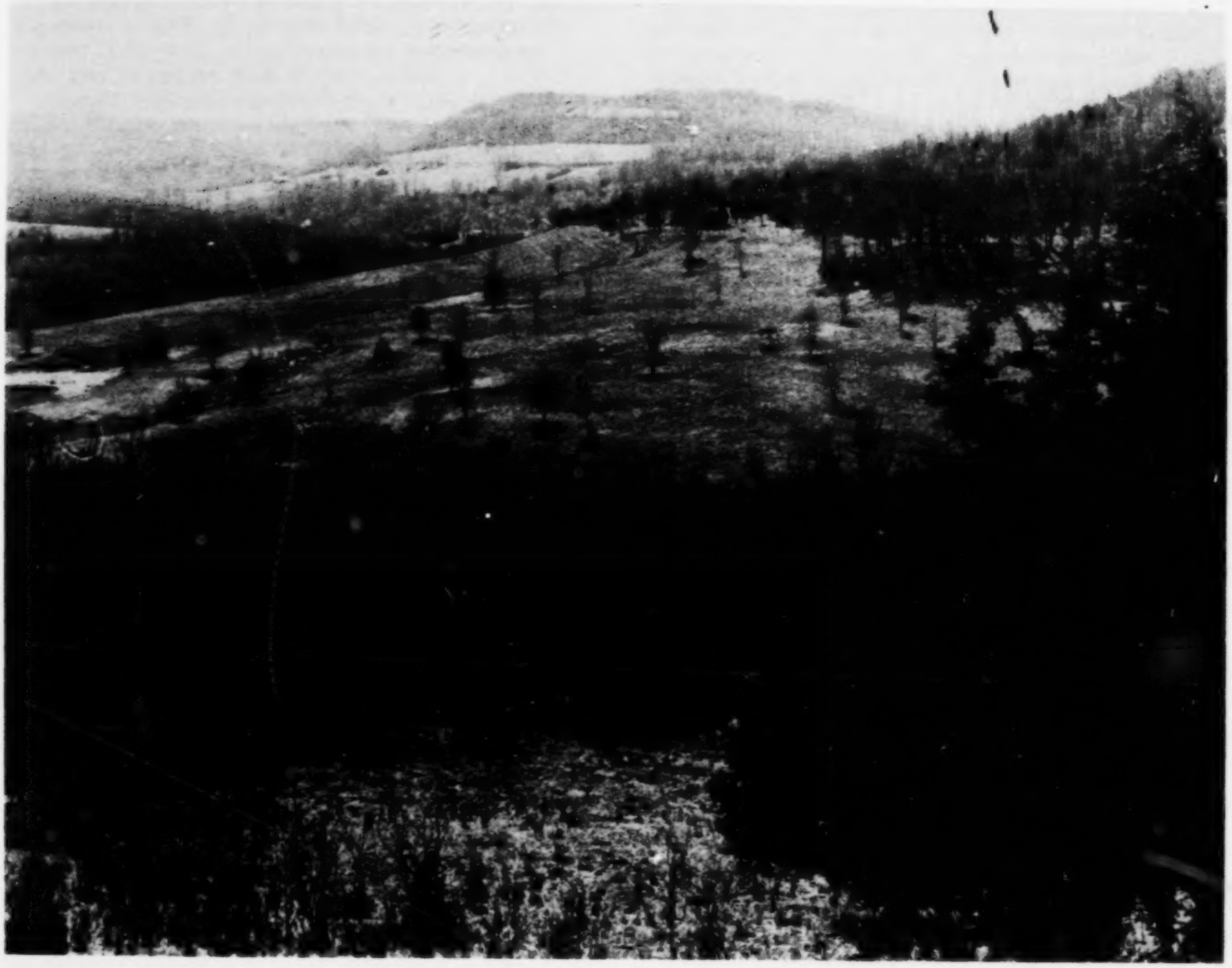


Figure 4.—Typical landscape of the Enders-Leesburg association. The soils in most cleared areas are rolling and are used as pasture, and the steeper slopes are wooded.

exposures had an open stand of hardwoods and a cover of herbaceous plants and grasses in small openings. Most of the soils are still wooded, but less sloping areas have been cleared and are used as pasture or rangeland. Some areas are idle (fig. 5). In many areas the stands of trees have a large proportion of cull trees, undesirable species, and saplings.

In the extreme southern part of the county, part of this map unit is in the Ozark National Forest. It is managed for multiple use objectives.

The areas are mainly sparsely settled. Roads and farmsteads generally are on ridgetops and in the less sloping areas and the narrow valleys of included soils. Fields commonly are surrounded by larger wooded areas.

Water for livestock is mostly furnished by farm ponds, small streams, and springs. Water for most household use and for some confinement livestock operations is furnished by individual wells and, in a few areas, by rural water systems.

In most areas, Enders and Leesburg soils are not suited to cultivated crops because of slope and stones on the surface. In some areas, however, Leesburg soils

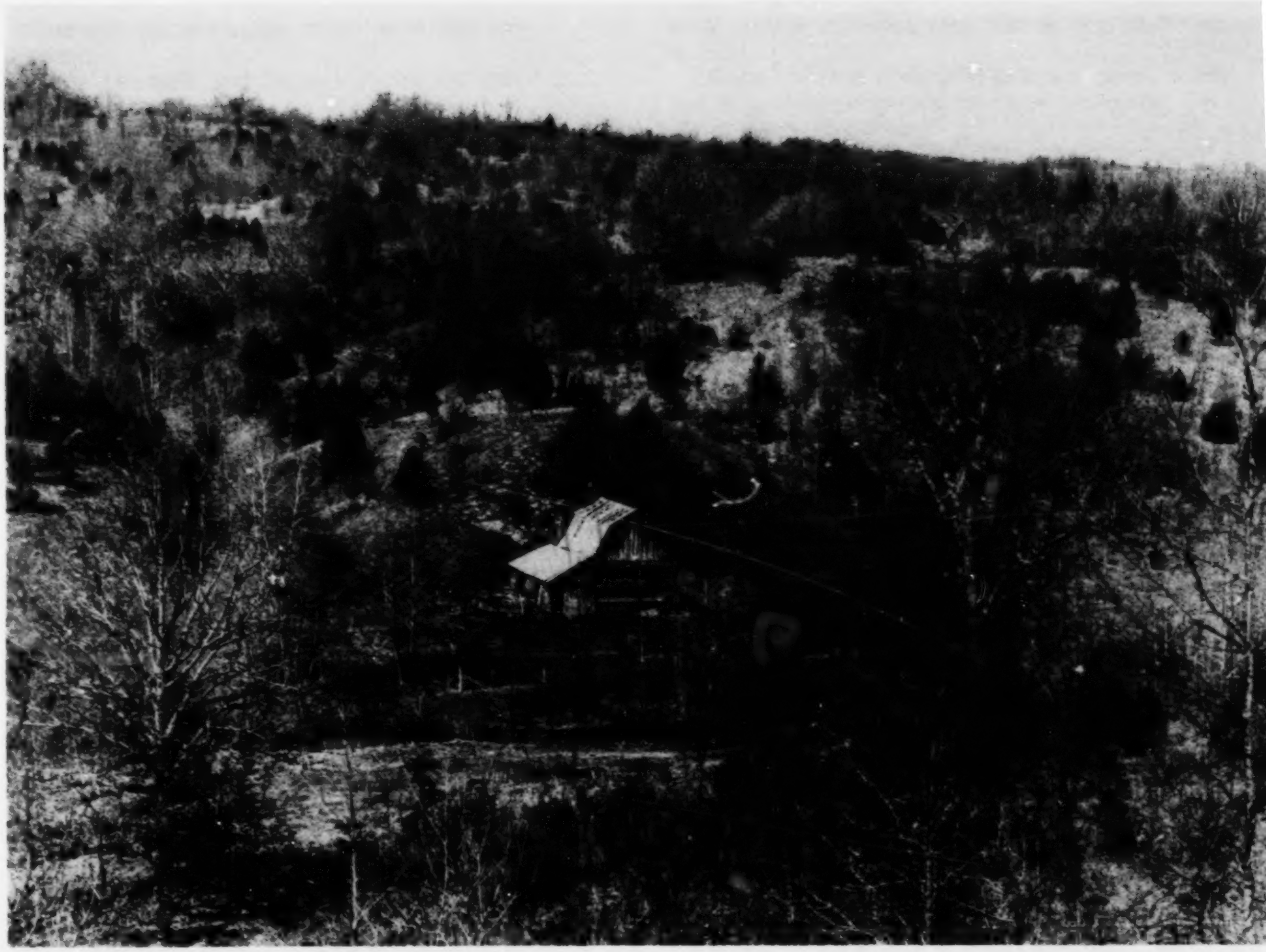


Figure 5.—Brush and redcedars are encroaching on abandoned pasture in an area of the Enders-Leesburg association. Ceda cobbly loam, frequently flooded, is on the valley floor at left.

that do not have stones on the surface are moderately suited to poorly suited to crops.

In most areas, Enders and Leesburg soils are poorly suited to use as pasture because of slope and stones on the surface. In some areas the soils are gently sloping to moderately sloping and are well suited to moderately suited to use as pasture.

Enders soils are moderately suited to use as woodland. The Leesburg soils on slopes that face south and west are also moderately suited, but those on slopes that face north and east are well suited to use as woodland.

Enders soils are poorly suited to most urban uses. Slope, the high shrink-swell potential, and the slow permeability in the subsoil are the main limitations. Leesburg soils are moderately suited to poorly suited to most urban uses, depending mainly upon the slope.

7. Steprock-Linker-Mountainburg

Moderately deep and shallow, gently sloping to moderately steep, well drained, loamy, gravelly, and stony soils that formed in residuum of acid sandstone interbedded with siltstone and shale

These soils are in the central and southern parts of the county. They are on ridges, hilltops, and mountaintops of the Boston Mountains. The slope ranges from 3 to 20 percent.

This map unit makes up about 3 percent of the county. It consists of about 40 percent Steprock soils, about 35 percent Linker soils, about 15 percent Mountainburg soils, and 10 percent soils of minor extent.

Steprock soils are moderately deep. They are on ridges, hilltops, and mountaintops. They have a dark brown gravelly loam or stony loam surface layer. The subsoil is yellowish red very gravelly loam; yellowish red very gravelly clay loam; and red, mottled very gravelly clay loam. It is underlain by soft, thin-bedded sandstone.

Linker soils are moderately deep. They are on the smoother part of mountaintops and hilltops. They have a dark brown loam surface layer. The subsoil is strong brown loam; yellowish red clay loam; and yellowish red, mottled gravelly loam. It is underlain by hard, level-bedded sandstone.

Mountainburg soils are shallow. They are on the rim of hilltops and mountaintops. They have a dark brown stony loam or gravelly loam surface layer and a brown stony loam subsurface layer. The subsoil is yellowish brown very gravelly loam. It is underlain by hard, level-bedded sandstone.

The minor soils are Enders soils on ridgetops, hillsides, and mountainsides and Johnsburg soils in slight depressions. A few small areas of rock outcrop are also included in the areas of this map unit.

The native vegetation was mixed upland hardwood forest. In most places the soils have been cleared and are used as pasture or hayland; however, some areas of stony soils remain wooded. In a few areas, a variety of cultivated crops are grown. The soils commonly are surrounded by larger, wooded areas of steeper soils. Some areas of this map unit are part of the Ozark National Forest; here, the soils commonly have been planted to pines.

Roads are few; they are mainly unimproved and carry little traffic. Outside the Ozark National Forest, farmsteads and farm buildings are common.

Water for livestock commonly is supplied by farm ponds or individual wells. Individual wells furnish most of the water for household uses. In a few areas, rural water systems supply water for households and confinement livestock operations.

Steprock soils are moderately suited to not suited to cultivated crops, depending on slope and stoniness. Linker soils are moderately suited to cultivated crops. Mountainburg soils are poorly suited or are not suited to cultivated crops, depending on slope and stoniness.

Steprock soils are well suited or moderately suited to use as pasture, depending on stoniness; Linker soils are well suited; and Mountainburg soils are moderately suited to poorly suited, depending on stoniness.

Steprock and Linker soils are moderately suited to use as woodland, and Mountainburg soils are poorly suited.

Steprock and Linker soils are mainly moderately suited to most urban uses. Depth to bedrock is the major limitation. Mountainburg soils are poorly suited to most urban uses because of shallowness to bedrock and stoniness.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Noark very cherty silt loam, 8 to 12 percent slopes, is one of several phases in the Norark series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Arkana-Moko complex, 8 to 20 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such difference could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1—Allen loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces and broad upland flats. The slopes are smooth and convex. The individual areas range from about 10 to 40 acres in size.

Typically, the surface layer is dark brown loam about 7 inches thick. The next layer is strong brown loam to a depth of about 11 inches. The subsoil is red clay loam to a depth of about 19 inches; below that, it is red, mottled clay loam to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid to very strongly acid throughout except where the surface layer has been limed. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are areas where the soils are eroded and plowing mixes subsoil material into the surface layer, a few shallow gullies, and areas of soils that are similar to Allen soils except that they are less than 60 inches deep to bedrock. Also included are small areas of Leadvale and Nella soils.

This soil is moderately suited to cultivated crops. Erosion is a severe hazard if cultivated crops are grown. Suitable crops include corn, soybeans, small grains, and truck crops. Under good management that includes contour cultivation and terraces, clean-tilled crops that leave a large amount of residue can be safely grown year after year in the less sloping areas.

The soil is well suited to use as pasture and hayland, and it is used mainly for hay and pasture. Suitable hay and pasture plants include alfalfa, tall fescue, white clover, lespedeza, and bermudagrass. Management concerns include proper stocking rate, rotation grazing, and weed and brush control.

This soil is well suited to use as woodland. Suitable species to plant include shortleaf pine and black walnut. There are no significant limitations.

This soil is moderately suited to well suited to most urban uses. The limitations for dwellings are slight. Slope is a moderate limitation for small commercial buildings, and low strength is a moderate limitation for local roads and streets. These limitations can be overcome by proper engineering design and careful installation. The moderate permeability is a moderate limitation for septic tank absorption fields, but the limitation can be overcome by enlarging the absorption area or modifying the absorption field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

2—Arkana very cherty silt loam, 8 to 15 percent slopes. This is a moderately deep, well drained, moderately sloping to moderately steep soil. It is on ridges and foot slopes. The slopes are smooth and convex. The individual areas range from about 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 7 inches thick. The subsoil is reddish brown cherty clay to a depth of about 12 inches, yellowish red cherty clay to a depth of about 24 inches, and brown, mottled clay to a depth of about 32 inches. It overlies hard, level-bedded limestone.

This soil is moderate in natural fertility and in content of organic matter. It is medium acid to mildly alkaline in the surface layer and strongly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. The very cherty surface limits the use of some farming equipment. The rooting zone is moderately deep. It is easily penetrated by roots down to the clayey subsoil, which somewhat restricts further penetration.

Included in mapping are small areas of Britwater and Moko soils and areas of soils that are similar to this Arkana soil except that they do not have a thick, dark surface layer or are more than 40 inches deep to bedrock.

This soil is not suited to cultivated crops. Runoff is rapid; if cultivated crops are grown, erosion is a very severe hazard, and this is the main limitation. In addition the high content of chert and the moderate depth to bedrock make the soil somewhat droughty.

In cleared areas this soil is used mostly as pasture, to which it is moderately suited, or as habitat for wildlife. Suitable pasture plants include tall fescue, bermudagrass, white clover, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

This soil is poorly suited to use as commercial woodland because the site index is low. Shortleaf pine and eastern redcedar are suitable trees. They can be grown for the production of cedar posts, pine pulpwood, or small pine or cedar sawlogs. Most of the woodland is also managed as habitat for wildlife. Equipment limitations and seedling mortality are moderate.

This soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope is also a severe limitation for small commercial buildings, and low strength is also a limitation for local roads and streets. In most places the limitations can be overcome, at some added cost, by proper engineering design and installation. The very slow permeability and the moderate depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

This soil is in capability subclass VIe and in woodland suitability group 5c8.

3—Arkana-Moko complex, 8 to 20 percent slopes. These are moderately deep and shallow, well drained, moderately sloping to moderately steep soils on rolling ridges and hillsides. The slopes are uneven and convex; in many areas they have a stepped appearance caused by narrow outcrops of horizontally bedded limestone.

The areas of these soils are so small and so closely intermingled that it was not practical to map them separately. The individual areas of each soil are about 1/2 acre to 4 acres in size. The mapped areas range from 15 to 200 acres in size. The Arkana soil makes up about 45 percent, the Moko soil makes up about 45 percent, and other soils and included areas make up 10 percent.

The Arkana soil is moderately deep. Typically, the surface layer is very dark grayish brown very cherty silt loam about 7 inches thick. The subsoil is reddish brown cherty clay to a depth of about 12 inches, yellowish red cherty clay to a depth of about 24 inches, and brown, mottled clay to a depth of about 32 inches. It overlies hard, level-bedded limestone bedrock.

The Arkana soil is moderate in natural fertility and in content of organic matter. It is medium acid to mildly alkaline in the surface layer and slightly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. The very cherty surface layer hinders the use of tillage implements. The rooting zone is moderately deep and can be penetrated by roots down to the clayey subsoil, which somewhat restricts further penetration.

The Moko soil is shallow. Typically, it is very dark grayish brown very stony silt loam about 10 inches thick over hard limestone bedrock.

The Moko soil is moderate in natural fertility and in content of organic matter. It is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Included with these soils in mapping are areas of rock outcrop and soils that are similar to Arkana soils except that they do not have a thick, dark surface layer or are more than 40 inches deep to bedrock.

The soils are not suited to cultivated crops. Runoff is rapid; erosion is a very severe hazard; and coarse fragments and rock ledges limit the use of tillage equipment.

The Arkana soil is poorly suited to use as pasture. Suitable pasture plants include tall fescue, bermudagrass, lespedeza, and white clover. The Moko soil is not suited to use as pasture. It should not be cleared of native vegetation or overgrazed because of the very severe hazard of erosion.

The soils are mainly wooded. The trees are low-grade hardwoods and redcedar. Much of the acreage is publicly owned and is managed as habitat for wildlife. The soils are poorly suited to commercial timber production because the site index is low. On the Arkana soil, suitable trees are shortleaf pine and eastern redcedar. Equipment limitations and seedling mortality are moderate. Eastern redcedar is adapted to the Moko soil. Equipment limitations and seedling mortality are severe, and erosion is a severe hazard.

The Arkana soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope is also a severe limitation for small commercial buildings, and low strength is also a severe limitation for local roads and streets. In most places the limitations can be overcome, at some added cost, by proper engineering design and installation. The very slow permeability and the moderate depth to rock are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The Moko soil is poorly suited to most urban uses. Shallowness to rock and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Slope is also a severe limitation for small commercial buildings. These limitations are difficult or impractical to overcome.

These soils are in capability subclass VIIs. The Arkana soil is in woodland suitability group 5c8, and the Moko soil is in group 5x3.

4—Arkana-Moko complex, 20 to 40 percent slopes. These are moderately deep and shallow, well drained, steep soils on hillsides. The slopes are uneven and convex; in many areas they have a stepped appearance caused by narrow outcrops of horizontally bedded limestone.

The areas of these soils are so small and so closely intermingled that it was not practical to map them separately. The individual areas of each soil are about 1/2 acre to 4 acres in size. The mapped areas range from 15 to 150 acres in size. The Arkana soil makes up about 55 percent, the Moko soil makes up about 35 percent, and other soils and included areas make up 10 percent.

The Arkana soil is moderately deep. Typically, the surface layer is very dark grayish brown very cherty silt loam about 7 inches thick. The subsoil is reddish brown cherty clay to a depth of about 12 inches, yellowish red cherty clay to a depth of about 24 inches, and brown, mottled clay to a depth of about 32 inches. It overlies hard, level-bedded limestone bedrock.

The Arkana soil is moderate in natural fertility and in content of organic matter. It is medium acid to mildly alkaline in the surface layer and slightly acid to moderately alkaline in the subsoil. Permeability is very slow, and the available water capacity is low. The very cherty surface layer and steep slopes limit the use of farming implements. The rooting zone is moderately deep, but the clayey subsoil somewhat restricts root penetration.

The Moko soil is shallow. Typically, it is very dark grayish brown very stony silt loam, very rocky, about 10 inches thick over hard limestone.

The Moko soil is moderate in natural fertility and in content of organic matter. It is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Included with these soils in mapping are areas of rock outcrop, soils that are similar to Arkana soils except that they do not have a thick, dark A horizon, and small areas of soils that are more than 40 inches deep to bedrock.

The soils are not suited to cultivated crops. Runoff is rapid; erosion is a very severe hazard; and steep slopes, coarse fragments, and rock ledges limit the use of tillage equipment.

The Arkana soil is poorly suited to use as pasture. Suitable pasture plants include tall fescue, lespedeza, and white clover. The Moko soil is not suited to use as pasture. It should not be cleared of native vegetation or overgrazed because of the very severe hazard of erosion.

The soils are mainly wooded. The trees are low-grade hardwoods and redcedar. Much of the acreage is publicly owned and is managed as habitat for wildlife. The soils are poorly suited to commercial timber production because the site index is low. On the Arkana soil, suitable trees are shortleaf pine and eastern redcedar; equipment limitations and seedling mortality are moderate, and erosion is a moderate hazard. Eastern redcedar is adapted to the Moko soil and can be used for fenceposts. Equipment limitations and seedling mortality are severe, and erosion is a severe hazard.

The Arkana soil is poorly suited to most urban uses. Slope and the high shrink-swell potential are severe limitations for dwellings, small commercial buildings, and local roads and streets. Low strength is also a severe limitation for local roads and streets. The very slow permeability, depth to rock, and slope are severe limitations for septic tank absorption fields. These limitations are difficult or impractical to overcome.

The Moko soil is poorly suited to most urban uses. Shallowness to rock, large stones, and slope are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. These limitations are difficult or impractical to overcome.

These soils are in capability subclass VIIs. The Arkana soil is in woodland suitability group 5c9, and the Moko soil is in group 5x3.

5—Britwater gravelly silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil. It is on stream terraces and narrow colluvial benches. The slopes are smooth and convex. The individual areas range from about 5 to 30 acres in size.

Typically, the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil is yellowish brown gravelly silt loam to a depth of about 16 inches, yellowish red gravelly silty clay loam to a depth of 36 inches, and yellowish red, mottled very gravelly silty clay loam to a depth of 72 inches or more.

Natural fertility is moderate, and the content of organic matter is low. The soil is medium acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. Gravel is a slight hindrance in tillage. The rooting zone is deep and is easily penetrated by roots.

Included with this soil in mapping are small areas of Peridge, Waben, and Secesh soils and narrow escarpments.

This soil is moderately suited to cultivated crops. Suitable crops are corn, soybeans, and small grains. Erosion is a severe hazard if cultivated crops are grown. Under good management that includes terraces and contour cultivation, clean-tilled crops that leave a large amount of residue can be safely grown year after year in the less sloping areas.

This soil is used mainly as pasture and hayland. It is well suited to hay and pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza.

This soil is well suited to use as woodland. Shortleaf pine, loblolly pine, black walnut, red oak, and eastern redcedar grow well. There are no significant limitations.

This soil is well suited to moderately suited to most urban uses. There are no significant limitations for dwellings and local roads and streets. Slope is a moderate limitation for small commercial buildings. It can be overcome by proper engineering design and careful installation. The moderate permeability is a moderate limitation for septic tank absorption fields. In most places this limitation can be overcome by enlarging the absorption field areas.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

6—Captina silt loam, 1 to 3 percent slopes. This is a deep, moderately well drained, nearly level soil. It is on broad uplands and stream terraces. The slopes are smooth and convex. The individual areas range from about 10 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is yellowish brown silty clay loam to a depth of about 20 inches and a compact and brittle fragipan to a depth of about 52 inches. The fragipan is mottled yellowish brown and light brownish gray. The upper part of the fragipan, to a depth of about 38 inches, is silty clay loam, and the lower part is very cherty silty clay loam. Below the fragipan, the lower part of the subsoil is red, mottled extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate above the fragipan and slow within the fragipan. The available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil. A perched water table is at a depth of 2 to 3 feet late in winter and early in spring.

Included with this soil in mapping are small areas of Johnsburg, Nixa, Peridge, and Tonti soils and a few small areas where the soil is eroded.

This soil is well suited to cultivated crops. Suitable crops include corn, soybeans, small grains, and truck crops. Erosion is a moderate hazard if cultivated crops are grown. Under good management that includes contour cultivation and terraces on long slopes, clean-tilled crops that leave a large amount of residue can be safely grown year after year.

In most areas the soil has been cleared and is used for hay and pasture (fig. 6). It is well suited to use as hayland and pasture. Suitable pasture and hay plants include tall fescue, white clover, bermudagrass, and lespedeza.

This soil is moderately suited to use as woodland. Suitable species include shortleaf pine, red oak, and eastern redcedar. There are no significant limitations.

This soil is moderately suited to poorly suited to most urban uses. Wetness is a moderate limitation for dwellings and small commercial buildings, and low strength is a severe limitation for local roads and streets. The limitations can be overcome by proper engineering design and drainage. The slow permeability and wetness are severe limitations for septic tank absorption fields. The limitations can be partly overcome by enlarging the absorption area and modifying the absorption field.

This soil is in capability subclass IIe and in woodland suitability group 4o7.

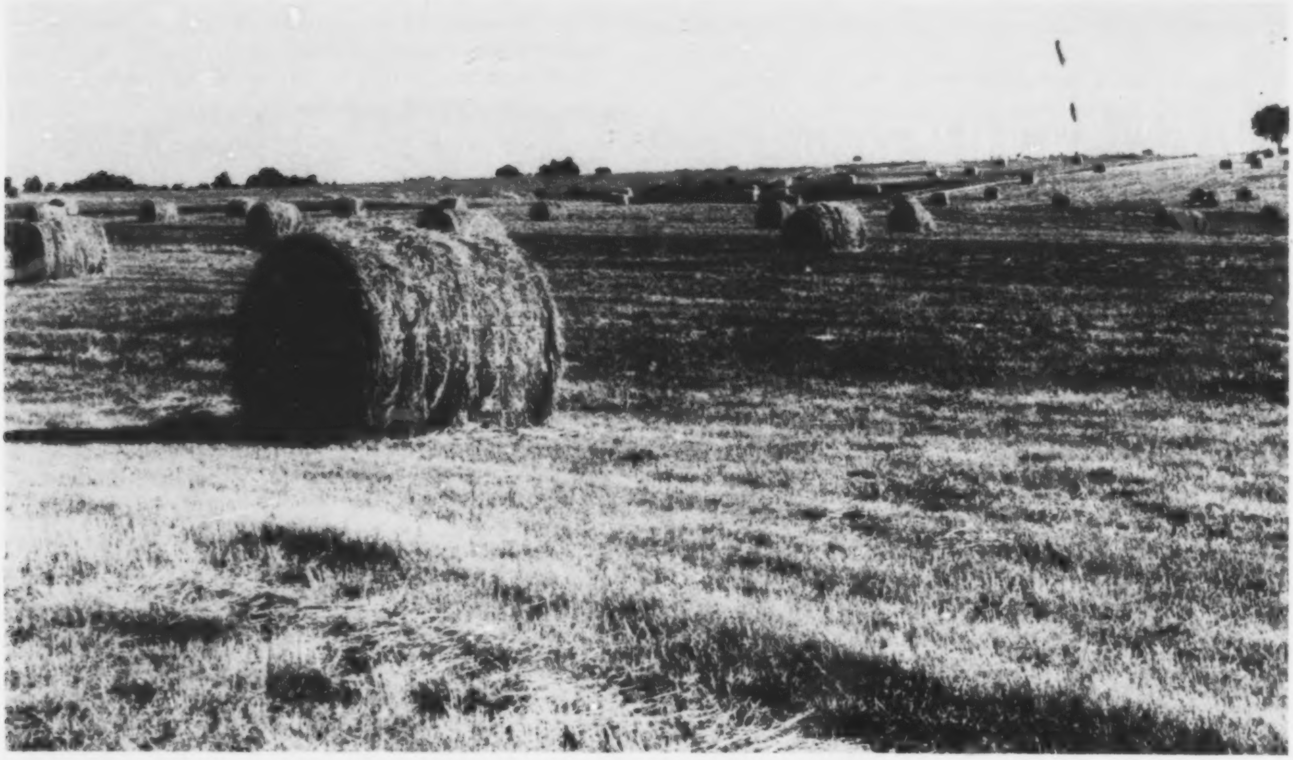


Figure 6.—This area of Captina silt loam, 1 to 3 percent slopes, is used as hayland.

7—Ceda gravelly fine sandy loam, occasionally flooded. This is a deep, well drained, level and nearly level soil on narrow flood plains. The individual areas range from about 10 to 50 acres in size. Slopes are 0 to 3 percent.

Typically, the surface layer is dark brown gravelly fine sandy loam about 15 inches thick. The underlying material is brown very gravelly fine sandy loam to a depth of about 58 inches and brown very gravelly loam to a depth of about 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is slightly acid or medium acid throughout. Permeability is rapid, and the available water capacity is low. Deep-rooted plants, however, can obtain water from lateral seepage. The soil has good tilth and can be worked within a wide range of moisture content. Gravel in the surface layer hinders tillage. The rooting zone is deep and is easily penetrated by roots. In most areas, this soil is flooded for very brief periods by fast-moving water that can cause severe damage very quickly. The floods occur about once every 3 to 7 years, usually between December and June.

Included with this soil in mapping are small areas of Cleora, Leesburg, and Nella soils, gravel bars, narrow overflow channels, and cobbly spots. In some small areas the soils are frequently flooded. There are some small areas of soils that have a dark, thick surface layer or that have layers of loamy sand or sandy loam.

This soil is poorly suited to cultivated crops mainly because of the hazard of flooding and the low available water capability. Suitable crops include grain sorghum and summer forage crops, such as sorghum-sudangrass crosses. Clean-tilled or sown crops that are planted after the flooding season can be safely grown in most years.

In most areas this soil is used as pasture or hayland. It is well suited to this use (fig. 7). Adapted hay and pasture plants include alfalfa, bermudagrass, tall fescue, white clover, and lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control. Also, there is a risk that pasture fences can be damaged by flooding.

This soil is well suited to use as woodland. Adapted trees include loblolly pine, shortleaf pine, sweetgum, black walnut, and sycamore. Seedling mortality is moderate.

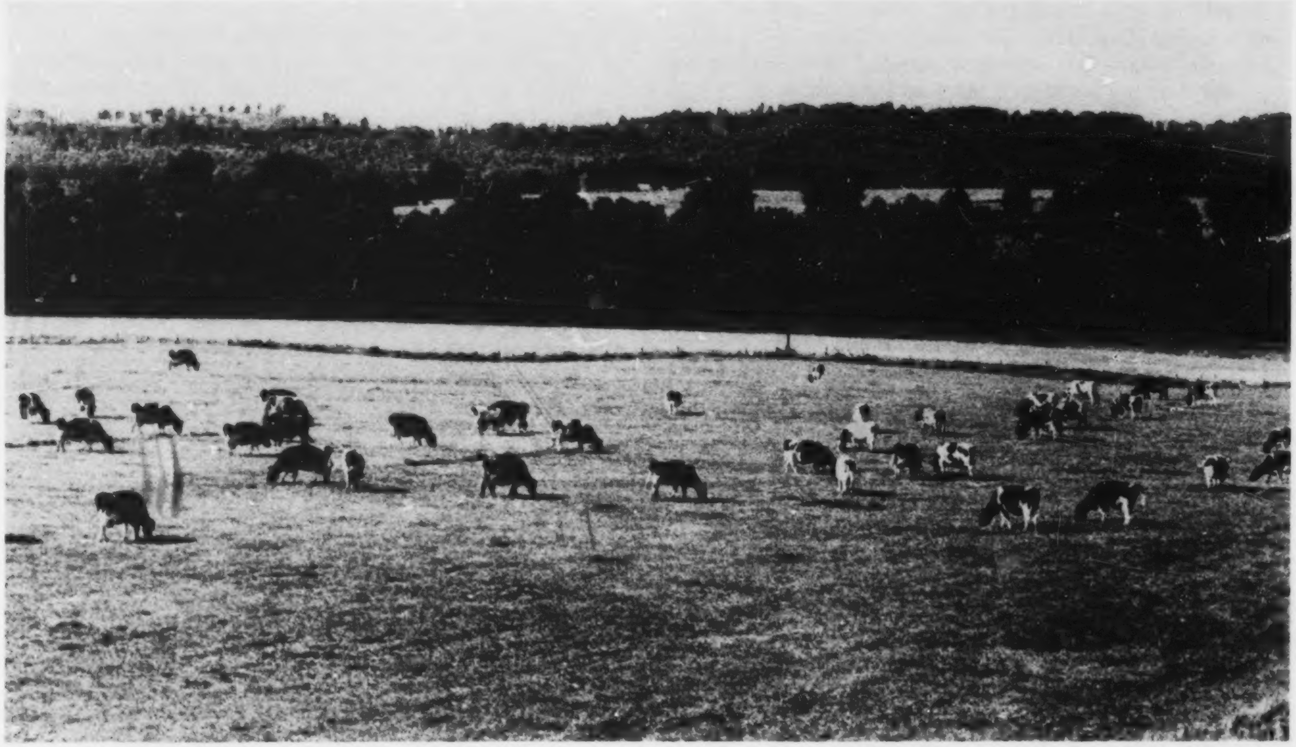


Figure 7.—Holstein cows grazing hybrid bermudagrass on Ceda gravelly fine sandy loam, occasionally flooded.

This soil is poorly suited to most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Flooding and the poor filtering capacity of the soil are severe limitations for septic tank absorption fields. Flooding can be prevented only by major flood control measures. The poor filtering capacity is very difficult or impractical to correct.

This soil is in capability subclass IVw and in woodland suitability group 3f8.

8—Ceda cobbly fine sandy loam, frequently flooded. This is a deep, well drained, level to nearly level soil on narrow flood plains along small streams. The individual areas range from about 10 to 100 acres in size. Slopes are 0 to 3 percent.

Typically, the surface layer is dark brown cobbly fine sandy loam about 15 inches thick. The underlying material is brown very cobbly fine sandy loam to a depth of about 30 inches; brown very gravelly fine sandy loam to a depth of about 58 inches; and brown very gravelly loam to a depth of about 72 inches.

This soil is low in natural fertility and organic matter content. The soil is slightly acid or medium acid throughout. Permeability is rapid. The available water capacity is low, but deep-rooted plants can obtain water from lateral seepage. Cobbles and gravel hinder the operation of some farm machinery. The rooting zone is deep and is easily penetrated by roots. In most areas, this soil is flooded frequently for very brief periods by fast-moving water that can cause severe damage very quickly. The floods usually occur between December and June.

Included with this soil in mapping are small areas of Cleora, Leesburg, and Nella soils, gravel bars, narrow overflow channels, and small areas of soils that have fewer coarse fragments in the surface layer than this Ceda soil. In some areas, flooding occurs less often than 1 year in 3. There are some small areas of soils that have a dark, thick surface layer or that have layers of loamy sand or sandy loam.

This soil is not suited to cultivated crops. Cobbles on the surface interfere with the operation of tillage equipment, the low available water capacity makes the soil droughty, and flooding is a major hazard.

In cleared areas, this soil is used mainly as pasture. It is moderately suited to this use, but it is not suited to use as hayland because the cobbles are a hindrance to the use of haying equipment. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Management concerns include proper stocking, controlled grazing, weed and brush control, and frequent flooding, which can cause damage to pasture fences.

This soil is well suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, sweetgum, black walnut, and sycamore. Seedling mortality is moderate.

This soil is poorly suited to most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Flooding and the poor filtering capacity are severe limitations for septic tank absorption fields. Major flood-control practices cannot completely control flooding, and the poor filtering capacity generally is impractical to correct.

This soil is in capability subclass VIIs and in woodland suitability group 3f8.

9—Clarksville very cherty silt loam, 20 to 50 percent slopes. This is a deep, somewhat excessively drained soil. It is steep to very steep and is on hillsides. The individual areas range from about 15 to 500 acres in size.

Typically, the surface is covered by about 1 inch of forest litter consisting of partly decomposed hardwood leaves and twigs. The surface layer is dark grayish brown very cherty silt loam about 1 inch thick. The subsurface layer is pale brown very cherty silt loam to a depth of about 14 inches. The subsoil is light yellowish brown extremely cherty silt loam to a depth of about 34 inches, brown extremely cherty silt loam to a depth of about 58 inches, and yellowish red extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is low because of the high content of chert (fig. 8), and the soil is droughty.

Included in mapping are small areas of Nixa, Noark, Moko, Elsah, and Waben soils, small areas of rock outcrop, and small areas where consolidated cherty limestone is within 3 feet of the surface.

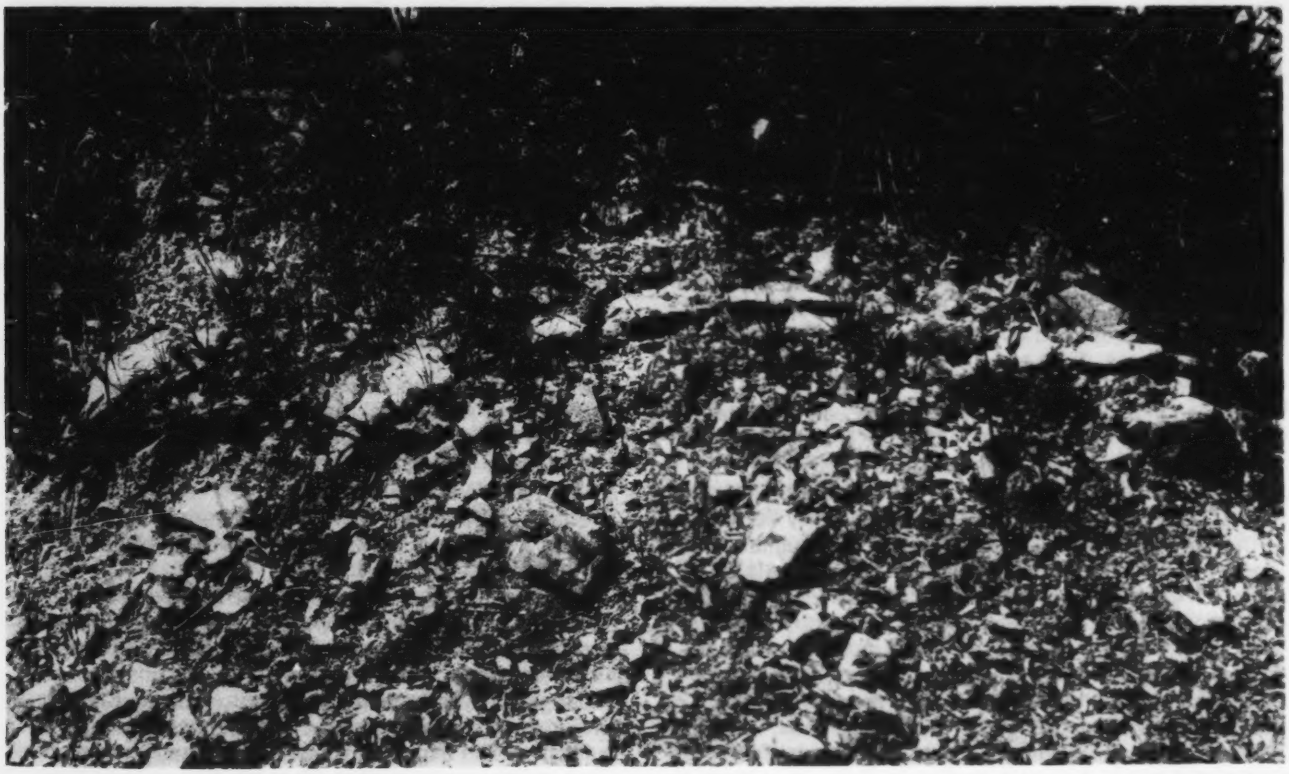


Figure 8.—A cut in an area of Clarksville very cherty silt loam, 20 to 50 percent slopes.

This soil is not suited to cultivated crops. It is poorly suited to use as pasture. In some less sloping areas it has been cleared and is in pasture. Tall fescue is suitable for seeding pastures. The steep slopes and the high content of chert fragments severely restrict the use of farm equipment.

This soil is moderately suited to use as woodland. It is used mainly as woodland. Adapted trees include white oak, loblolly pine, and shortleaf pine. The use of equipment is severely limited. Seedling mortality is severe.

This soil is poorly suited to most urban uses. The steep slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability subclass VIIs and in woodland suitability group 4f9.

10—Cleora fine sandy loam, occasionally flooded. This is a deep, well drained, level and nearly level soil. It is on the flood plain along the larger creeks and rivers. The individual areas are dominantly 10 to 80 acres in size. Slopes are 0 to 3 percent.

Typically, the surface layer is dark brown fine sandy loam about 21 inches thick. The underlying material is dark brown sandy loam to a depth of about 30 inches; dark brown, stratified fine sandy loam to a depth of about 51 inches; dark brown, stratified fine sandy loam and sand to a depth of 79 inches or more.

Natural fertility and the content of organic matter are moderate. The soil is medium acid or slightly acid. Permeability is moderately rapid, and the available water capacity is medium. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by roots. This soil is flooded for very brief periods by fast-moving water, which can cause severe damage in a short time if the soil is not protected by close-growing plant cover. The floods occur about once every 5 to 7 years late in winter or early in spring.

Included in mapping are a few small areas of Ceda and Healing soils and a few areas of soils that have gravelly or very gravelly layers below a depth of 70 inches. Also included are small areas of gravel bars, old river scars, and a few areas that are frequently flooded.

The soil is well suited to cultivated crops. Suitable crops include corn, forage crops, soybeans, and truck crops. Occasional flooding and a slight moderate hazard of erosion are the main limitations if cultivated crops are grown. Under good management that includes erosion control, crops that leave a large amount of residue can be safely grown in most years if they are planted after the normal flooding season.

This soil is used mainly as pasture and hayland. It is well suited to hay and pasture (fig. 9). Suitable pasture and hay plants include bermudagrass, tall fescue, white clover, alfalfa, lespedeza, and johnsongrass. Management concerns include proper stocking rates, controlled grazing, and weed control.

The soil is well suited to use as woodland. Suitable trees include sweetgum, cottonwood, black walnut, and sycamore. There are no significant limitations.

This soil is poorly suited to most urban uses. Flooding is a severe limitation for dwellings, small commercial buildings, and septic tank absorption fields. Flooding and low strength are moderate limitations for local roads and streets. Major flood control measures are needed to prevent flooding.

This soil is in capability subclass IIw and in woodland suitability group 2o4.

11—Elsah very cherty silt loam, occasionally flooded. This is a deep, well drained to somewhat excessively drained, level and nearly level soil. It is on narrow flood plains (fig. 10) in the northern part of the county. Slopes are 0 to 3 percent. The individual areas range from about 10 to 50 acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 6 inches thick. The underlying material is yellowish brown very cherty silt loam to a depth of about 23 inches; yellowish brown extremely cherty silt loam to a depth of about 30 inches; yellowish brown very cherty silt loam to a depth of about 50 inches; and light yellowish brown extremely cherty silt loam to a depth of 70 inches or more.

This soil is low in natural fertility and in content of organic matter. Reaction is slightly acid or medium acid throughout. Permeability is moderate to moderately rapid. The available water capacity is low; however, deep-rooted plants can obtain water from lateral seepage. The soil has good tilth and can be worked within a wide range of moisture content. The large quantity of chert in the surface layer hinders tillage. The rooting zone is deep and is easily penetrated by roots.

In most areas this soil is flooded for brief periods by fast-moving water, which can cause severe damage very quickly in areas without a protective plant cover. The floods occur about once every 4 to 7 years, usually between December and June.

Included with this soil in mapping are small areas of Secesh and Waben soils, gravel bars, and narrow overflow channels. Also included are some small areas of soils that have a dark surface layer more than 10 inches thick.

This soil is only moderately suited to cultivated crops because of the hazard of flooding, the cherty surface, and the low available water capacity. Suitable crops include summer forage crops, such as sorghum-sudangrass hybrids, and truck crops, such as tomatoes. Under good management that includes contour cultivation and minimum tillage, warm-season crops that leave a large amount of residue can be grown in most years.

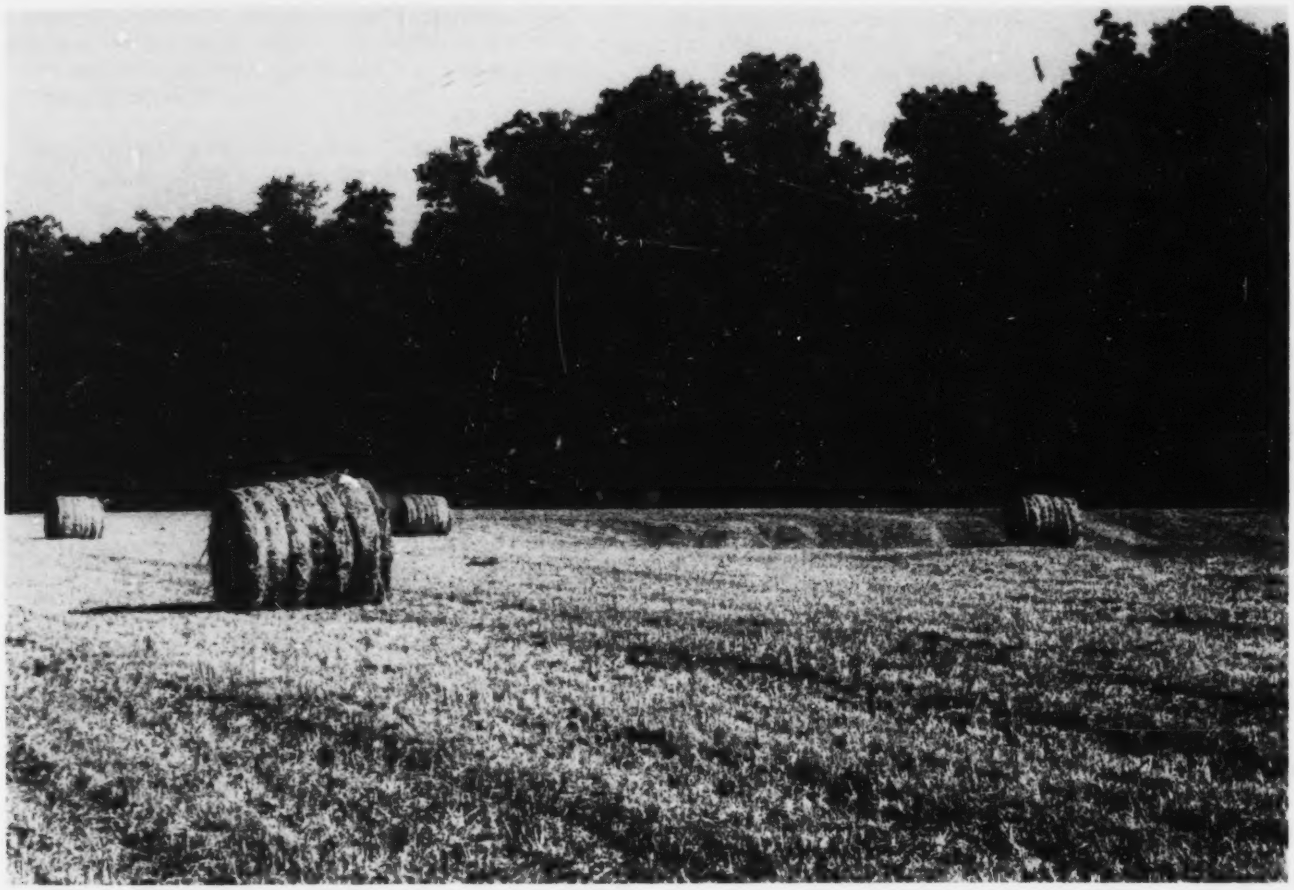


Figure 9.—Cleora fine sandy loam, occasionally flooded, is a productive agricultural soil. However, it has severe limitations for housing and other urban uses because of flooding. The stream flows through the wooded area beyond the hayfield.

The soil is well suited to use as pasture. It is used mainly as pasture. Adapted pasture plants are bermudagrass, tall fescue, white clover, and annual lespedeza. The surface chert is a moderate limitation to the use of haying equipment. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable trees include sweetgum, black walnut, and sycamore. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. Flooding is a severe hazard for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Flooding can be prevented only by major flood control practices.

This soil is in capability subclass IIIw and in woodland suitability group 3f5.

12—Enders gravelly loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil. It is on upland benches, ridgetops, and toe slopes of ridges and hills. The areas are about 6 to 25 acres in size.

Typically, the surface layer is dark brown gravelly loam about 6 inches thick. The next layer is strong brown gravelly loam to a depth of about 10 inches. The subsoil is red clay to a depth of about 26 inches; mottled red and light gray clay to a depth of about 52 inches; and mottled yellowish brown and light gray shale silty clay to a depth of about 58 inches. It overlies soft shale bedrock.

This soil is low in natural fertility and in content of organic matter. It ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by clayey subsoil.

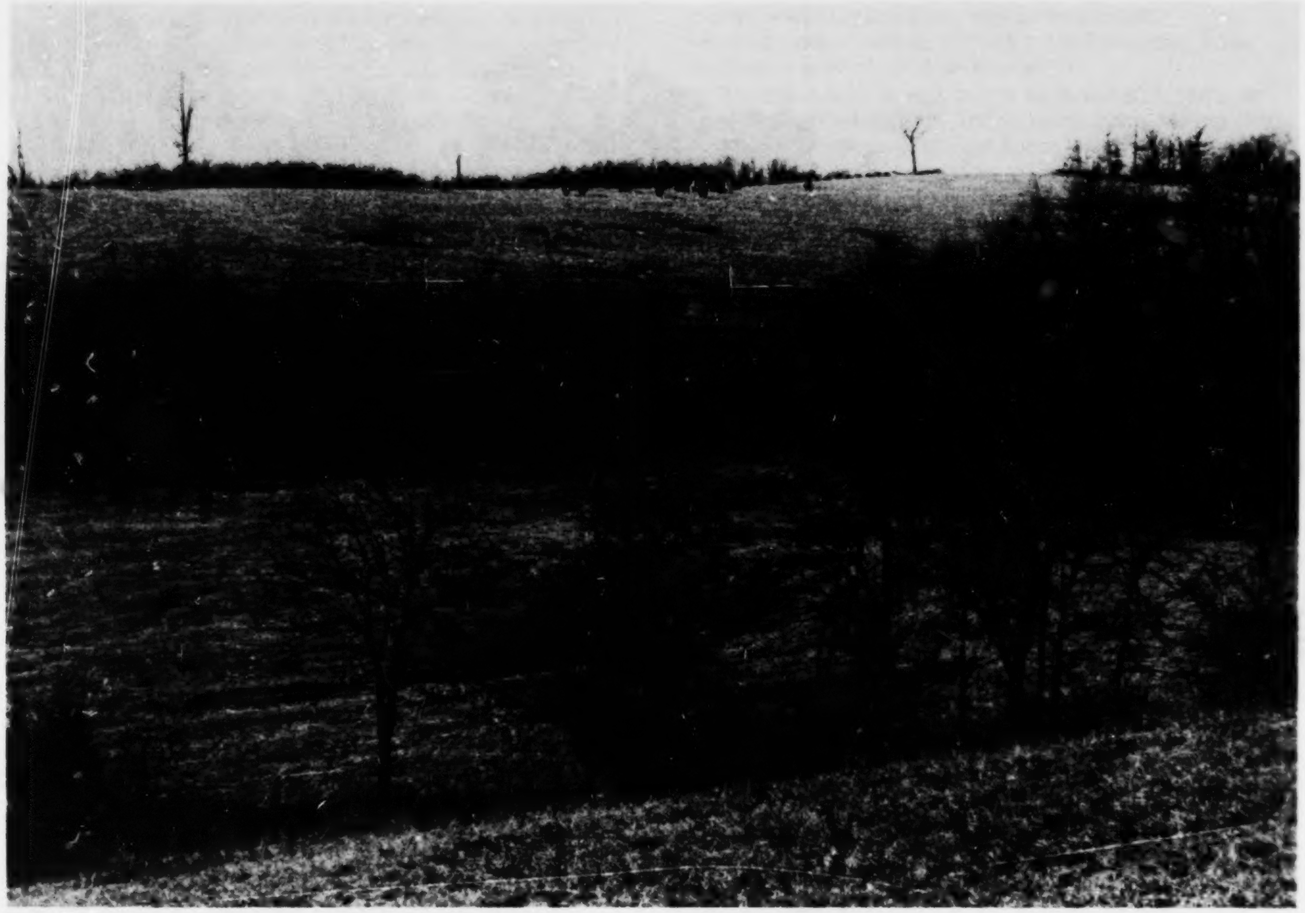


Figure 10.—Elsah very cherty silt loam, occasionally flooded, is in the low-lying area at center. Noark soils are on the adjacent side slopes.

Included with this soil in mapping are small areas of eroded soils and stony spots; areas of soils that are similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches; and small areas of Leadvale, Leesburg, Mountainburg, and Steprock soils.

The soil is poorly suited to cultivated crops. If cultivated crops are grown, runoff is rapid, and erosion is a very severe hazard. Suitable crops include small grains and forage crops. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be grown occasionally in a cropping system that keeps close-growing plant cover on the soil most of the time. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is moderately suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rates, controlled grazing, and brush and weed control.

The soil is moderately suited to use as woodland. Suitable trees to plant include loblolly pine and shortleaf pine. There are no significant limitations.

The soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Low strength is a severe limitation for local roads and streets. The limitation generally can be overcome by special design and construction methods. The very slow permeability is a severe limitation to the use of this soil as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by enlarging the absorption area or by modifying the field.

This soil is in capability subclass IVe and in woodland suitability group 4o1.

13—Enders gravelly loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil. It is on upland crests, benches, and toe slopes of ridges and hills. The areas are about 10 to 100 acres in size.

Typically, the surface layer is dark brown gravelly loam about 6 inches thick. The next layer is strong brown gravelly loam to a depth of about 10 inches. The subsoil is red clay to a depth of about 26 inches; mottled red and light gray clay to a depth of about 52 inches; and mottled yellowish brown and light gray shaly silty clay to a depth of about 58 inches. It overlies soft shale bedrock.

This soil is low in natural fertility and in content of organic matter. It ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Included with this soil in mapping are small eroded areas, shale outcrops, areas of soils that are similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches, and small areas of Leesburg, Mountainburg, Nella, and Steprock soils.

The soil is not suited to cultivated crops. Erosion is a very severe hazard in cultivated areas.

The soil is moderately suited to use as pasture. It is used mainly as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rate, proper grazing, and brush and weed control.

The soil is moderately suited to use as woodland. Suitable trees to plant include loblolly pine and shortleaf pine. There are no signficant concerns in woodland management.

The soil is poorly suited to urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope is also a severe limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. The limitations generally can be overcome by special design and construction methods. The very slow permeability is a severe limitation for use of this soil as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by enlarging the absorption area or by modifying the field.

This soil is in capability unit VIe and in woodland suitability group 4o1.

14—Enders stony loam, 3 to 12 percent slopes. This is a deep, well drained, gently sloping to moderately sloping soil. It is on upland crests and toe slopes of ridges and hills. The individual areas range from about 10 to 60 acres in size.

Typically, the surface layer is very dark grayish brown stony loam about 3 inches thick. The subsurface layer is dark brown stony loam to a depth of about 6 inches. Below that, there is a layer of strong brown gravelly loam to a depth of about 10 inches. The subsoil is red clay to a depth of about 26 inches; mottled red and light gray clay to a depth of about 52 inches; and mottled yellowish brown and light gray shaly silty clay to a depth of about 58 inches. It overlies soft shale bedrock.

This soil is low in natural fertility and in content of organic matter. Reaction ranges from strongly acid through extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Included in mapping are some eroded spots; shale outcrops; areas of soils that are similar to Enders soils except that they have shale bedrock at a depth of more than 60 inches; and small areas of Leadvale, Leesburg, Mountainburg, and Steprock soils.

The soil is not suited to cultivated crops. Erosion is a very severe hazard if the soil is cultivated, and the surface stones interfere with tillage.

The soil is moderately suited to use as pasture. It is commonly used as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rates, proper grazing, and brush and weed control. Surface stones hinder the use of mowing and haying equipment.

The soil is moderately suited to use as woodland. In some areas it is used as woodland. Suitable species to plant include loblolly pine and shortleaf pine. The use of equipment is moderately limited. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope is an additional severe limitation for small commercial buildings, and low strength is a severe limitation for local roads and streets. The limitations generally can be overcome by special design and construction methods. The very slow permeability is a severe limitation to the use of this soil as septic tank absorption fields. This limitation is difficult to overcome; however, it can be partly overcome by enlarging the absorption area or by modifying the field.

This soil is in capability subclass VIs and in woodland suitability group 4x2.

15—Enders-Leesburg stony loams, 8 to 20 percent slopes. These are deep, well drained, moderately sloping to moderately steep soils. The areas of these soils are so intermingled that they could not be separated at the scale selected for mapping. The areas of this complex are broad and range from about 15 to several hundred acres in size. The individual areas of each soil are about 2 to 5 acres in size. The Enders soil is on mountainsides, hillsides, and ridges, and the Leesburg soil is on narrow benches and in colluvial positions on side slopes. Enders stony loam makes up about 55 percent of each mapped area, Leesburg stony loam makes up about 35 percent, and other soils and included areas make up 10 percent.

Typically, the Enders soil has a surface layer of very dark grayish brown stony loam about 3 inches thick. The subsurface layer is brown stony loam to a depth of about 6 inches. Below that, there is a layer of strong brown gravelly loam to a depth of about 10 inches. The subsoil is red clay to a depth of about 52 inches, and mottled yellowish brown and light gray shaly silty clay to a depth of about 58 inches. It overlies soft shale bedrock.

The Enders soil is low in natural fertility and in content of organic matter. It is strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Typically, the Leesburg soil has a surface layer of dark brown stony loam about 3 inches thick. The subsurface layer is yellowish brown stony loam to a depth of about 7 inches. The subsoil is yellowish brown gravelly loam to a depth of about 11 inches; strong brown gravelly clay loam to a depth of about 23 inches; mottled strong brown, yellowish red, and pale brown gravelly clay loam to a depth of about 38 inches; mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay to a depth of about 62 inches; and mottled yellowish brown, yellowish red, and light gray gravelly clay to a depth of 72 inches or more.

The Leesburg soil is low in natural fertility and in content of organic matter. Reaction is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid throughout the rest of the soil. Permeability is moderate, and the available water capacity is medium. The root zone is deep and is easily penetrated by roots.

Included with these soils in mapping are small areas of Mountainburg, Nella, and Steprock soils. Also included are spots where shale bedrock is near the surface, narrow bands of rock outcrop, a few small areas where the surface stones have been removed, and small areas of soils that are similar to the Enders soil except that they are more than 60 inches deep to bedrock.

These soils are not suited to cultivated crops and are poorly suited to use as pasture. The large stones on the surface limit the use for farm equipment. Erosion is a very severe hazard if the land is cleared for cultivation or if pasture is overgrazed. However, in some areas the soils are used as pasture. Suitable pasture plants include tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rate, controlled grazing, weed and brush control, and maintaining or improving soil fertility.

In most areas the soils are wooded. The trees are mainly low-grade hardwoods. The Enders soil is moderately suited to use as woodland, and the Leesburg soil is well suited. Suitable trees are shortleaf pine, loblolly pine, and, for the Leesburg soil, white oak and red oak. On both soils, large stones are a moderate limitation to the use of equipment.

The Enders soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Slope is a severe limitation for small commercial buildings. Low soil strength is a severe limitation for roads and streets. The limitations generally can be overcome, at considerable added cost, by proper engineering design and careful installation procedures. The very slow permeability is a severe limitation for septic tank absorption fields. This limitation is difficult to overcome.

The Leesburg soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and for local roads and streets and a severe limitation for small commercial buildings. Slope and the moderate permeability are moderate limitations for septic tank absorption fields. The limitations can be overcome by proper engineering design and careful installation procedures.

These soils are in capability subclass VIIs. The Enders soil is in woodland suitability group 4x2, and the Leesburg soil is in group 3x8.

16—Enders-Leesburg stony loams, 20 to 40 percent slopes. These are deep, well drained, steep soils. The areas of these soils are so intermingled that they could not be separated at the scale selected for mapping. The areas of this complex are broad and range from about 25 to several hundred acres in size. The individual areas of each soil are about 2 to 5 acres in size. The Enders soil is on mountainsides and hillsides, and the Leesburg soil is on narrow benches and in the more colluvial positions on side slopes. Enders stony loam makes up about 45 percent of each mapped area, Leesburg stony loam makes up about 40 percent, and other soils and included areas make up about 15 percent.

Typically, the Enders soil has a surface layer of very dark grayish brown stony loam about 3 inches thick. The subsurface layer is brown stony loam to a depth of about 6 inches. Below that, there is a layer of strong brown gravelly loam to a depth of about 10 inches. The subsoil is red clay to a depth of about 26 inches, mottled red and light gray clay to a depth of about 52 inches, and mottled yellowish brown and light gray shaly silty clay to a depth of about 58 inches. It overlies soft shale bedrock.

The Enders soil is low in natural fertility and in content of organic matter. It is strongly acid to extremely acid throughout. Permeability is very slow, and the available water capacity is medium. Root penetration is restricted by the clayey subsoil.

Typically, the Leesburg soil has a surface layer of dark brown stony loam about 3 inches thick. The subsurface layer is yellowish brown stony loam to a depth of about 7 inches. The subsoil is yellowish brown gravelly loam to a depth of about 11 inches; strong brown gravelly clay loam to a depth of about 23 inches; mottled strong brown, yellowish red, and pale brown gravelly clay loam to a depth of about 38 inches; mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay to a depth of about 62 inches; and mottled yellowish brown, yellowish red, and light gray gravelly clay to a depth of 72 inches or more.

The Leesburg soil is low in natural fertility and organic matter. Reaction is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid throughout the rest of the soil. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

Included with these soils in mapping are small areas of Mountainburg, Nella, and Steprock soils. Also included are spots where shale bedrock is near the surface, narrow bands of rock outcrop, nearly vertical bluffs, bouldery areas, and small areas of soils that are similar to Enders soils except that they are more than 60 inches deep to bedrock.

These soils are not suited to cultivated crops and are poorly suited to use as pasture. The large stones on the surface and the steep slopes severely limit the use of farm equipment. Erosion is a very severe hazard if the land is cleared for cultivation or if pasture is overgrazed. However, in some places the less steeply sloping soils are used as pasture. Suitable pasture plants include tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rate, controlled grazing, weed and brush control, and maintaining or improving soil fertility.

In most areas, the soils are wooded. The trees are mainly low-grade hardwoods. On slopes that face north and east, the Enders soil is moderately suited to use as woodland, but on slopes that face south and west it is poorly suited. On slopes that face north and east, the Leesburg soil is well suited to use as woodland; on slopes that face south and west, it is moderately suited. Suitable trees to plant include shortleaf pine, loblolly pine, and, on the Leesburg soil, white oak and red oak. On both soils, erosion is a moderate hazard; seedling mortality is moderate; and the large stones and steep slopes moderately limit the use of equipment.

The Enders soil is poorly suited to most urban uses. The high shrink-swell potential and slope are severe limitations for dwellings, small commercial buildings, and local roads and streets. Low strength is also a severe limitation for roads and streets. The limitations are difficult and expensive or impractical to overcome. The very slow permeability and slope are severe limitations for septic tank absorption fields. The limitations are difficult and expensive or impractical to overcome. The Leesburg soil is also poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, roads and streets, and septic tank absorption fields. This limitation is difficult and expensive or impractical to overcome.

The soils are in capability subclass VIIs. The Enders soil on slopes that face north and east is in woodland suitability group 4r9, and on slopes that face south and west it is in group 5r3. The Leesburg soil on slopes that face north and east is in woodland suitability group 3x9, and on slopes that face south and west it is in group 4x3.

17—Healing silt loam, 1 to 3 percent slopes. This is a deep, well drained, nearly level soil that is rarely flooded. It is on flood plains and low terraces along larger streams in the county. Slopes are smooth and convex. The areas of this soil parallel the stream course. The individual areas are about 15 to 80 acres in size.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is reddish brown silty clay loam to a depth of about 33 inches; reddish brown, mottled silty clay loam to a depth of about 70 inches; and mottled reddish brown and yellowish brown loam to a depth of 85 inches. It is underlain by brown very gravelly sandy loam that extends to a depth of 95 inches or more.

This soil is moderate in natural fertility and in content of organic matter. The surface layer and the upper part of the subsoil are medium acid or strongly acid, and the lower part of the subsoil and the underlying material are medium acid to very strongly acid. Permeability is moderate, and the available water capacity is high. The soil has good tilth and can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by roots. Under abnormal weather conditions, this soil is flooded for very brief periods in winter and spring. The floods occur about once in 10 to 25 years.

Included with this soil in mapping are small areas of Cleora and Ceda soils. Also included are small areas of soils that have an overwash layer of light-colored loam or fine sandy loam on the surface and small areas of old river scars.

The soil is well suited to cultivated crops. Suitable crops include soybeans, corn, forage crops, small grains, and truck crops. Erosion is a moderate hazard if cultivated crops are grown. Under good management that includes erosion control, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Minimum tillage, contour cultivation, cover crops, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is used mainly as improved pasture and hayland. It is well suited to use as pasture. Suitable pasture and hay plants include alfalfa, white clover, lespedeza, bermudagrass, johnsongrass, and tall fescue. Management concerns include proper stocking rate, rotation grazing, and weed control.

The soil is well suited to use as woodland. Suitable species include black walnut, cottonwood, sycamore, and other hardwoods. There are no significant limitations.

The soil is poorly suited to most urban uses. Rare flooding is a severe limitation for dwellings and small commercial buildings and a moderate limitation for septic tank absorption fields. Major flood control measures are required to prevent flooding. Low strength is a severe limitation for local roads and streets. The use of suitable fill material or special design can overcome this limitation, but at added cost. The moderate permeability is also a moderate limitation for septic tank absorption fields. This limitation can be overcome by enlarging the absorption area or by modifying the field itself.

This soil is in capability subclass IIe and in woodland suitability group 2o7.

18—Johnsburg silt loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, level soil. It is on stream terraces and broad uplands. Individual areas range from about 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown, mottled silt loam to a depth of about 22 inches over a firm and compact fragipan that extends to a depth of about 34 inches. The fragipan is mottled, light brownish gray and yellowish brown silty clay loam. The lower part of the subsoil is yellowish brown, mottled silty clay loam to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid to slightly acid in the surface layer and extremely acid to strongly acid below the surface layer. Permeability is moderate above the fragipan and very slow within the fragipan. The available water capacity is medium. Water and roots easily penetrate to the fragipan, which restricts further penetration. In seasons of high rainfall, there is a perched water table above the fragipan late in winter and early in spring.

Included with this soil in mapping are a few small areas of Leadvale, Captina, and Mayes soils. Also included are small areas of poorly drained soils that have a clay subsoil and small areas with low mounds.

The soil is well suited to cultivated crops. Suitable crops include small grains, soybeans, and forage crops. Tillage operations commonly are delayed several days after rain because of wetness. Wetness is the major limitation, and a system of surface drains is needed. Under good management that includes drainage, sown and clean-tilled crops that leave a large amount of residue can be safely grown year after year.

The soil is well suited to use as pasture and hayland, and this is its main use. Wetness limits the use of haying equipment in seasons of high rainfall. Suitable pasture and hay crops include tall fescue, white clover, bermudagrass, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable trees include water oak, sweetgum, sycamore, and green ash. Wetness is a moderate limitation to the use for equipment in planting and harvesting trees.

The soil is moderately suited to most urban uses. Wetness and low strength are moderate limitations for local roads and streets. Wetness is a moderate limitation for small commercial buildings and dwellings. The limitations can be partly overcome by good engineering design and proper installation. The very slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

This soil is in capability subclass IIw and in woodland suitability group 3w8.

19—Leadvale loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil on stream terraces and colluvial foot slopes. The individual areas range from about 10 to 40 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The upper part of the subsoil, to a depth of about 19 inches, is yellowish brown loam. Below that, there is a mottled, compact and brittle loam fragipan that is yellowish brown to a depth of about 28 inches and strong brown to a depth of about 47 inches. The lower part of the subsoil, below the fragipan, is mottled, light gray and strong brown clay loam to a depth of about 62 inches and light gray, mottled clay to a depth of 78 inches or more.

This soil is low in natural fertility and in content of organic matter. Except where the surface layer has been limed, the soil is strongly acid or very strongly acid. Permeability is slow, and the available water capacity is medium. Tilth is good; this soil can be worked within a wide range of moisture content. The fragipan restricts root penetration and slows the movement of water through the soil. A perched water table is 16 to 24 inches below the surface late in winter and early in spring.

Included with this soil in mapping are soils that are similar to the Leadvale soils except that they are less than 60 inches deep to bedrock. Also included are small areas of Allen, Ceda, Leesburg, Nella, and Johnsburg soils, shallow gullies, and areas of eroded soils where plowing mixes the surface layer with subsoil material.

This soil is moderately suited to cultivated crops. Erosion is a severe hazard if cultivated crops are grown. Suitable crops include soybeans, corn, small grains, forage crops, and truck crops. Under good management that includes measures to control erosion, clean-tilled or sown crops that leave a large amount of residue can be safely grown year after year in the less sloping areas. Terraces, contour cultivation, minimum tillage, and grasses and legumes included in the cropping system help to reduce runoff, to control erosion, and to maintain good tilth.

This soil is well suited to use as pasture and hayland, and it is used mainly as pasture and hayland. Suitable plants include tall fescue, white clover, bermudagrass, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

This soil is well suited to use as woodland. Suitable species to plant are loblolly pine and shortleaf pine. There are no significant limitations.

This soil is moderately suited to most urban uses. Wetness is a moderate limitation for dwellings. Wetness and slope are moderate limitations for small commercial buildings. Low strength and wetness are moderate limitations for local roads and streets. All of these limitations can be overcome by proper engineering design and drainage. The slow permeability and wetness are severe limitations for septic tank absorption fields. These limitations can be partly overcome by enlarging the absorption area and by modifying the absorption field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

20—Leesburg gravelly loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil. It is on stream terraces, benches, and valley toe slopes. The areas range from about 6 to 30 acres in size.

Typically, the surface layer is brown gravelly loam about 7 inches thick. The subsurface layer is yellowish brown gravelly loam to a depth of about 11 inches. The subsoil is strong brown gravelly clay loam to a depth of about 23 inches; mottled strong brown, yellowish red, and pale brown gravelly clay loam to a depth of about 38 inches; mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay to a depth of about 62 inches; and mottled yellowish brown, yellowish red, and light gray gravelly clay to a depth of about 72 inches.

This soil is low in natural fertility and content of organic matter. The surface layer is medium acid or strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate except in the lower part of the subsoil, where it is slow. The available water capacity is medium. The rooting zone is deep.

Included with this soil in mapping are a few small areas of Enders, Leadvale, and Nella soils, a few small stony spots, and a few areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer.

The soil is moderately suited to cultivated crops. Runoff is rapid, and erosion is a severe hazard. Suitable crops include corn, soybeans, forage crops, small grains, and truck crops. Under good management that includes erosion control, clean-tilled and sown crops that leave a large amount of residue can be safely grown year after year. Management needs to be intensified as the length and gradient of the slope increase. Terraces, contour cultivation, minimum tillage, and grasses and legumes included in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is well suited to use as pasture, and it is used mainly as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable species include loblolly pine and shortleaf pine. There are no significant limitations.

The soil is moderately suited to most urban uses. The limitations for dwellings and local roads and streets are only slight. Slope is a moderate limitation for small commercial buildings. The moderate permeability is a moderate limitation for septic tank filter fields. These limitations generally can be overcome by special design and construction methods.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

21—Leesburg gravelly loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil. It is on benches and valley toe slopes. Individual areas range from about 8 to 30 acres in size.

Typically, the surface layer is brown gravelly loam about 7 inches thick. The subsurface layer is yellowish brown gravelly loam to a depth of about 11 inches. The subsoil is strong brown gravelly clay loam to a depth of about 23 inches; mottled strong brown, yellowish red, and pale brown gravelly clay loam to a depth of about 38 inches; mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay to a depth of about 62 inches; and mottled yellowish brown, yellowish red, and light gray gravelly clay to a depth of about 72 inches.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid or strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate except in the lower part of the subsoil, where it is slow. The available water capacity is medium. The rooting zone is deep.

Included with this soil in mapping are a few small areas of Enders, Leadvale, and Nella soils, a few small stony spots, and a few areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer.

The soil is poorly suited to cultivated crops. Suitable crops include small grains and forage crops. Runoff is rapid, and erosion is a very severe hazard. Under good management that includes erosion control, clean-tilled crops and sown crops can be grown occasionally in a cropping system that includes close-growing cover most of the time. Terraces, contour cultivation, minimum tillage, cover crops, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is well suited to use as pasture and hayland, and it is used mainly as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable species include loblolly pine and shortleaf pine. There are no significant limitations.

The soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. These limitations can be overcome by special design and by careful construction methods. Slope and the moderate permeability are moderate limitations for septic tank absorption fields. These limitations generally can be overcome by enlarging the filter field and by proper engineering design.

This soil is in capability subclass IVe and in woodland suitability group 3o7.

22—Leesburg stony loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping soil. It is on stream terraces and benches on hills and mountains. The individual areas range from about 8 to 40 acres in size.

Typically, the surface layer is dark brown stony loam about 3 inches thick. The subsurface layer is yellowish brown stony loam to a depth of about 7 inches. The subsoil is yellowish brown gravelly loam to a depth of about 11 inches; strong brown gravelly clay loam to a depth of about 23 inches; mottled strong brown, yellowish red, and pale brown gravelly clay loam to a depth of about 38 inches; mottled strong brown, yellowish red, and light brownish gray very gravelly silty clay to a depth of about 62 inches; and mottled yellowish brown, yellowish red, and light gray gravelly clay to a depth of about 72 inches.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid or strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate except in the lower part of the subsoil, where it is slow. The available water capacity is medium. The rooting zone is deep. Stones on the surface limit the use of farm equipment.

Included with this soil in mapping are a few small areas of Enders, Nella, and Steprock soils.

This soil is not suited to cultivated crops. The stones are a hindrance to tillage. Runoff is rapid, and erosion is a very severe hazard if the soil is cultivated.

The soil is moderately suited to use as pasture, and in cleared areas it is used mainly as pasture. Stones hinder the use of mowing and haying equipment. Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable species include loblolly pine and shortleaf pine. Stones on the surface are a moderate limitation to the use of equipment.

The soil is moderately suited to most urban uses. Slope and low strength are moderate limitations for local roads and streets. Slope is a moderate limitation for dwellings. These limitations can be overcome by special design and construction methods. Slope is a severe limitation for small commercial buildings. This limitation generally can be overcome by special design, but it may add to the cost. The moderate permeability and slope are moderate limitations for septic tank absorption fields. The limitations generally can be overcome by proper engineering design and by enlarging the absorption area or modifying the absorption field.

This soil is in capability subclass VIs and in woodland suitability group 3x8.

23—Linker loam, 3 to 8 percent slopes. This is a moderately deep, well drained, gently sloping soil. It is on mountaintops and ridgetops. The slopes are smooth and convex. The individual areas range from about 6 to 75 acres in size.

Typically, the surface layer is dark brown loam about 7 inches thick. The next layer is strong brown loam to a depth of about 12 inches. The subsoil is yellowish red clay loam to a depth of about 33 inches. The underlying layer is yellowish red, mottled gravelly loam to a depth of about 38 inches. It overlies hard, level-bedded, acid sandstone bedrock.

Natural fertility and the content of organic matter are low. This soil is strongly acid to extremely acid throughout, except where the surface layer has been limed. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. The rooting zone is moderately deep and is easily penetrated by roots.

Included in mapping are stony spots and areas of soils that are similar to Linker soils except that bedrock is at a

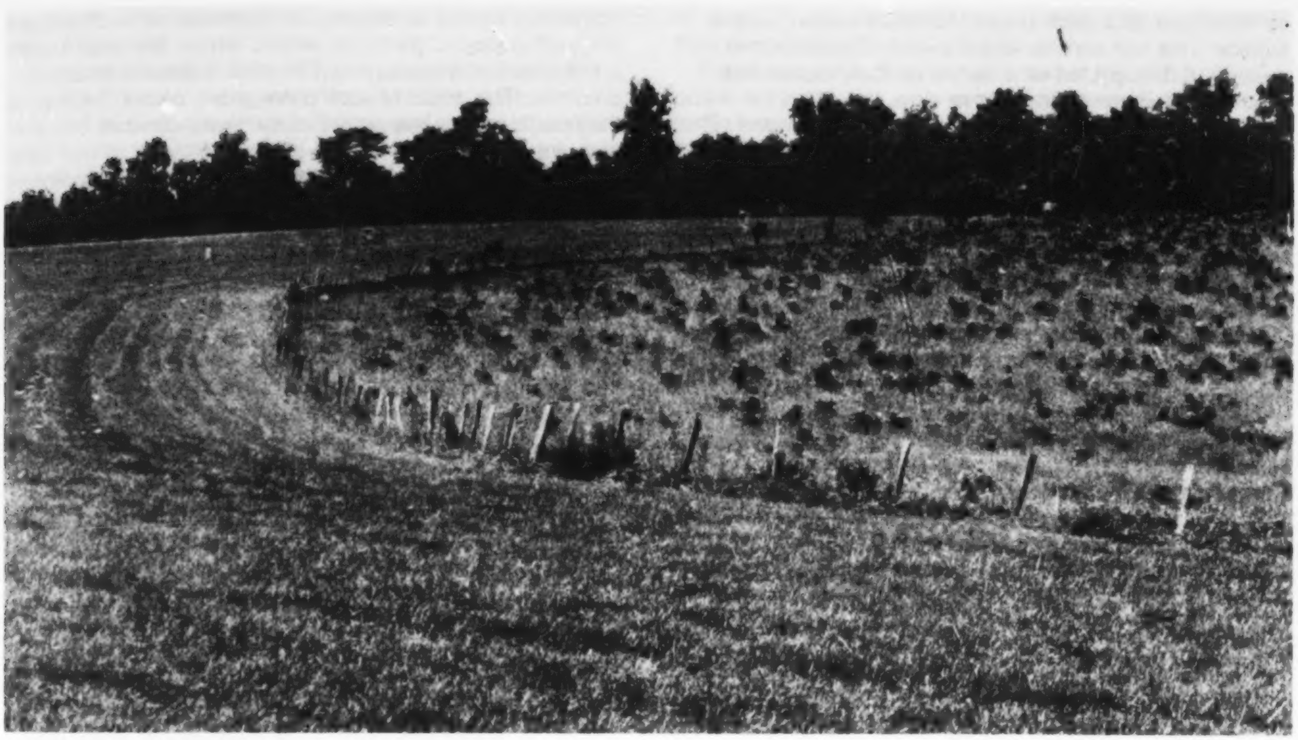


Figure 11.—This area of Linker loam, 3 to 8 percent slopes, has been planted to fescue and is used as hayland and pasture. To the right of the fence, Mountainburg stony loam, 3 to 20 percent slopes, is used as native pasture.

depth of more than 40 inches or is rippable to a depth of 5 to 8 feet. Also included are small areas of Enders, Leadvale, Mountainburg, and Steprock soils.

The soil is moderately suited to cultivated crops. Runoff is rapid, and erosion is a severe hazard. Suitable crops include soybeans, forage crops, small grains, and truck crops. Under good management that includes erosion control, clean-tilled and sown crops that leave a large amount of residue can be safely grown year after year. Management should be intensified as the length and gradient of the slope increase. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is used mainly for hay and pasture (fig. 11). It is well suited to use as hayland and pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza.

The soil is moderately well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, and eastern redcedar. There are no significant limitations.

The soil is moderately suited to most urban uses. The moderate depth to bedrock is a moderate limitation for dwellings and local roads and streets. Slope and the depth to bedrock are moderate limitations for small commercial buildings. The limitations can be overcome by proper engineering design. The moderate depth of bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult to overcome.

This soil is in capability subclass IIIe and in woodland suitability group 4o1.

24—Mayes silty clay loam, 0 to 1 percent slopes. This is a deep, somewhat poorly drained, level soil. It is in slight depressions and on concave slopes on stream terraces and in valleys. The individual areas range from about 7 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is very dark gray, mottled silty clay loam to a depth of about 24 inches; very dark gray, mottled silty clay to a depth of about 34 inches; variegated very dark gray and olive brown silty clay to a depth of about 41 inches; and dark gray, mottled clay to a depth of 72 inches or more.

This soil is moderate in natural fertility and in content of organic matter. It is slightly acid or medium acid in the surface layer and medium acid to mildly alkaline in the subsoil. This soil shrinks and cracks to the surface in periods of drought; when it becomes moist again, the cracks seal. Permeability is very slow, but when the soil is cracked, water enters rapidly until the cracks seal. The available water capacity is high. The surface layer can be easily tilled only within a narrow range of moisture content. A seasonal high water table is near the surface late in winter and early in spring in seasons of high rainfall. The rooting zone is deep, but root penetration is slowed because of the high clay content in the lower part of the subsoil and the seasonal high water table.

Included with this soil in mapping are small areas of Johnsburg soils. Also included are small areas in which the surface layer is silt loam.

The soil is well suited to cultivated crops. Suitable crops include soybeans, small grains, and forage crops. Runoff is very slow, and wetness is a moderate limitation. Farming operations are delayed for several days after a rain unless a surface drainage system is installed. Under good management that includes drainage, sown or clean-tilled crops that leave a large amount of residue can be safely grown year after year.

In most areas the soil is used as pasture and hayland. It is well suited to use as pasture. Suitable pasture and hay plants include tall fescue, white clover, bermudagrass, and lespedeza. Wetness sometimes interferes with the use of haying equipment. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include water oak, green ash, and sweetgum. Equipment limitations are severe, and seedling mortality is moderate.

The soil is poorly suited to most urban uses. The high shrink-swell potential and wetness are severe limitations for dwellings and small commercial buildings. Low strength and the high shrink-swell potential are severe limitations for local roads and streets. The limitations are difficult and expensive to overcome. Wetness and the very slow permeability are severe limitations for septic tank absorption fields. These limitations are very difficult or impractical to overcome.

This soil is in capability subclass IIw and in woodland suitability group 4w6.

25—Moko very stony silt loam, very rocky, 12 to 40 percent slopes. This is a shallow, well drained, moderately steep and steep soil on hillsides. The areas are about 10 to 40 acres in size.

Typically, the surface layer is very dark grayish brown very stony silt loam about 5 inches thick. The next layer is dark brown very stony silt loam to a depth of about 10 inches. It is underlain by hard limestone bedrock.

The rock outcrop that gives this Moko soil its very rocky aspect consists of long, narrow bands or ledges projecting along the contour across the slope. It commonly makes up about 5 to 7 percent of each mapped area and gives the slopes where it is promine a stairstepped appearance. The rock is limestone or dolomite. The areas of rock outcrop are so narrow that they could not be separated at the scale used in mapping.

The soil is moderate in natural fertility and in content of organic matter. It is neutral or mildly alkaline throughout. Permeability is moderate, and the available water capacity is very low.

Included in mapping are small areas of Arkana soils and nearly vertical limestone bluffs.

This soil is not suited to cultivation or to use as pasture or hayland. The limestone outcrops, shallownes to rock, and steepness of slope are limitations that are very difficult or impractical to overcome. Erosion is a very severe hazard if the native vegetation is disturbed.

The soil is mainly in native vegetation, which consists of an open stand of eastern redcedar and mixed hardwood trees and native grasses in the openings. Some areas are publicly owned and are managed as habitat for wildlife. The soil is suited to use as habitat fo wildlife and to related recreation uses. In some places the native grass cover can be utilized for very limited grazing.

The soil is poorly suited to use as commercial woodland because the site index is low; however, woodland is a suitable use. Eastern redcedar is adapte to the soil and can be used for cedar post production. Erosion is a severe hazard, the use of equipment is severely limited, and seedling mortality is also severe.

The soil is poorly suited to most urban uses. Shallowness to bedrock, slope, and large stones are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. The limitations are very difficult or impractical to overcome.

This soil is in capability subclass VIIs and in woodlan suitability group 5x3.

26—Mountainburg gravelly loam, 3 to 12 percent slopes. This is a shallow, well drained, gently sloping to moderately sloping soil. It is on ridgetops. The individua areas range from about 7 to 25 acres in size.

Typically, the surface layer is dark grayish brown gravelly loam about 5 inches thick. The subsurface laye is brown very gravelly loam and is also about 5 inches thick. The subsoil is yellowish brown very gravelly loam to a depth of about 18 inches. It overlies sandstone bedrock.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid to ver strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallow depth to bedrock and the high content of rock fragments. The rooting zone extends to a depth of less than 20 inches.

Included with this soil in mapping are a few small areas of Enders, Linker, and Steprock soils. Also included are sandstone rock ledges and areas of shallow soils similar to Mountainburg soils except that they overlie rippable shale bedrock.

The soil is poorly suited to cultivated crops. Erosion is a very severe hazard if cultivated crops are grown. Also, the soil is droughty because of its shallowness and high gravel content. Suitable crops include small grains. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be grown occasionally in a cropping system that keeps close-growing cover on the soil most of the time. Contour cultivation, minimum tillage, and grasses and legumes included in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is moderately suited to use as pasture. It is used mainly as pasture. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Concerns in management include proper stocking rate, rotation grazing, and brush and weed control.

The soil is poorly suited to commercial timber production. Shortleaf pine, loblolly pine, and eastern redcedar are suitable species. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. Shallowness to bedrock is a severe limitation for dwellings, small commercial buildings, and local roads and streets. This limitation can be partly overcome by special design. Shallowness to bedrock is a severe limitation for septic tank filter fields. This limitation is difficult or impractical to overcome.

This soil is in capability subclass IVe and in woodland suitability group 5d2.

27—Mountainburg stony loam, 3 to 20 percent slopes. This is a shallow, well drained, gently sloping to moderately steep soil. It is on ridgetops and hilltops. The individual areas range from about 8 to 60 acres in size.

Typically, the surface layer is dark brown stony loam about 1 inch thick. The subsurface layer is brown stony loam about 4 inches thick. The subsoil is yellowish brown very gravelly loam to a depth of about 18 inches. It overlies sandstone bedrock.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallow depth to bedrock and the large stones. The rooting zone is less than 20 inches deep. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Enders, Leesburg, Linker, Nella, and Steprock soils. Also included are sandstone rock ledges and areas of shallow soils similar to Mountainburg soils except that they overlie rippable shale bedrock.

This soil is not suited to cultivated crops or hay. It is poorly suited to use as pasture. Pasture or native range is the main use in cleared areas. Surface stones restrict the use of farm equipment, and the soil is droughty. Erosion is a very severe hazard if this soil is cultivated. Fescue and lespedeza are suitable pasture plants. Brush and weed control, as well as proper stocking rate and controlled grazing, is a major concern in management.

The soil is poorly suited to commercial timber production. However, woodland and wildlife habitat are common and suitable uses. Shortleaf pine, eastern redcedar, and loblolly pine are adapted species. Stones are a moderate limitation to the use of equipment. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. Shallowness to bedrock, large stones, and slope are severe limitations for small commercial buildings. Shallowness to bedrock and large stones are severe limitations for dwellings, local roads and streets, and septic tank absorption fields. The limitations are difficult or impractical to overcome.

This soil is in capability subclass VIs and in woodland suitability group 5x2.

28—Mountainburg very stony loam, 20 to 50 percent slopes. This is a shallow, well drained, steep to very steep soil. It is on hillsides and mountainsides. The individual areas range from about 15 to 50 acres in size.

Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is brown stony loam about 4 inches thick. The subsoil is yellowish brown very gravelly loam to a depth of about 18 inches. It overlies sandstone bedrock.

This soil is low in natural fertility and in content of organic matter. The surface layer is medium acid to very strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderately rapid. The available water capacity is very low because of the shallow depth to bedrock and the large stones. The rooting zone is less than 20 inches deep. It is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Enders, Leesburg, Nella, and Steprock soils. Also included are sandstone rock ledges, nearly vertical bluffs, and small areas of shallow soils similar to Mountainburg soils except that they overlie soft shale bedrock.

The soil is not suited to cultivated crops or to use as pasture. Surface stones, rock ledges, and steep slopes severely restrict the use of farm equipment, and the soil is droughty. Erosion is a very severe hazard if the native vegetation is disturbed. This soil is best used as woodland, native pasture, or habitat for wildlife.

The soil is poorly suited to commercial timber production, but it is used mainly as woodland. Shortleaf pine, loblolly pine, and eastern redcedar are adapted species. The use of equipment is severely limited, and erosion is a severe hazard. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. Shallowness to bedrock, large stones, and slope are severe limitations for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. The limitations are very difficult or impractical to overcome.

This soil is in capability subclass VIIs and in woodland suitability group 5x3.

29—Nella gravelly loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil on stream terraces, foot slopes, and mountain benches. The areas range from about 8 to 30 acres in size.

Typically, the surface layer is dark brown gravelly loam about 5 inches thick. The subsoil is yellowish red gravelly loam to a depth of about 12 inches, yellowish red gravelly clay loam to a depth of about 36 inches, and red gravelly clay loam to a depth of about 72 inches.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. The gravel can interfere with tillage. The rooting zone is deep and is easily penetrated by roots.

Included with mapping are a few small areas of Allen, Leadvale, and Leesburg soils. Also included are a few small areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer.

This soil is moderately suited to cultivated crops. Suitable crops include grain sorghum, winter small grains, soybeans, and truck crops. The soil is suited to apple orchards. Runoff is rapid, and erosion is a severe hazard. Gravel in the surface layer limits the use of some kinds of equipment. Under good management that includes adequate measures to control erosion, clean-tilled crops can be safely grown where the slopes are more gentle. Terraces, contour cultivation, minimum tillage, crop residue management, cover crops, and grasses and legumes included in the cropping system help in reducing runoff, controlling erosion, and maintaining good tilth.

This soil is well suited to use as pasture, and it is used mainly as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

This soil is well suited to use as woodland. Suitable species include loblolly pine, black walnut, and shortleaf pine. There are no significant limitations.

This soil is well suited to moderately suited to most urban uses. The limitations for dwellings and local roads and streets are slight. Slope is a moderate limitation for small commercial buildings. It can be overcome, at some added cost, by proper engineering design. The moderate permeability is a limitation for septic tank absorption fields. It can be overcome by enlarging the filter field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

30—Nella gravelly loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil. It is on stream terraces, foot slopes, and mountain benches. The individual areas range from about 10 to 40 acres in size.

Typically, the surface layer is dark brown gravelly loam about 5 inches thick. The subsoil is yellowish red gravelly loam to a depth of about 12 inches, yellowish red gravelly clay loam to a depth of about 36 inches, and red gravelly clay loam to a depth of about 72 inches.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. The gravel can interfere with tillage. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are a few small areas of Allen, Enders, Leadvale, Leesburg, and Steprock soils. Also included are stony spots and a few small areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer.

This soil is poorly suited to most cultivated crops. It is suited to small grains and forage crops. Runoff is rapid, and erosion is a very severe hazard. Under good management that includes erosion control, clean-tilled crops and sown crops can be grown occasionally in a cropping system that uses close-growing cover most of the time. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is well suited to use as pasture and hayland. In most areas that have been cleared, it is used for this purpose. Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Management concerns include proper stocking, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable species include loblolly pine, shortleaf pine, black walnut, white oak, and northern red oak. There are no significant limitations.

The soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. Slope and the moderate

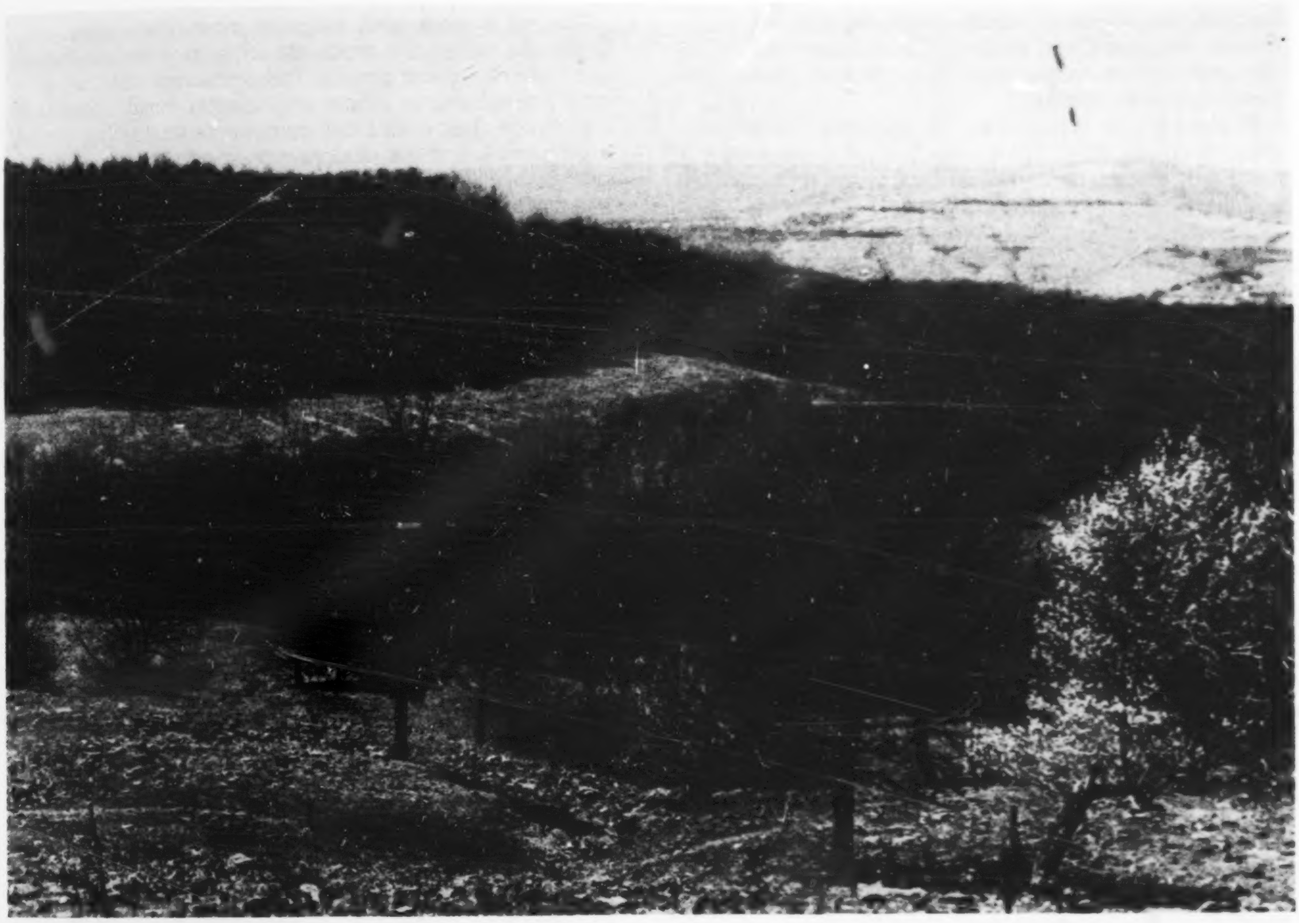


Figure 12.—The mountain bench (in left background) of Nella gravelly loam, 12 to 20 percent slopes, has been cleared, so that the area has a terraced appearance.

permeability are moderate limitations for septic tank absorption fields. These limitations can be overcome by enlarging the filter field and by proper engineering design.

This soil is in capability subclass IVe and in woodland suitability group 3o7.

31—Nella gravelly loam, 12 to 20 percent slopes. This is a deep, well drained, moderately steep soil on foot slopes and mountain benches (fig. 12). The individual areas range from about 8 to 100 acres in size.

Typically, the surface layer is dark brown gravelly loam about 5 inches thick. The subsoil is yellowish red gravelly loam to a depth of about 12 inches; yellowish red gravelly clay loam to a depth of about 36 inches; and red gravelly clay loam to a depth of about 72 inches.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. The gravel can interfere with tillage. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are a few small areas of Allen, Enders, Leesburg, and Steprock soils. Also included are stony spots and small areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer.

This soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard.

This soil is moderately suited to use as pasture and hayland. In cleared areas, it is used mainly as pasture.

Suitable pasture plants include bermudagrass, tall fescue, lespedeza, and white clover. Management concerns include proper stocking, controlled grazing, and weed and brush control.

This soil is well suited to use as woodland. Suitable species include loblolly pine, shortleaf pine, black walnut, white oak, and northern red oak. There are no significant limitations.

This soil is poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. This limitation can be overcome by proper engineering design.

This soil is in capability subclass VIe and in woodland suitability group 3o7.

32—Nella stony loam, 8 to 20 percent slopes. This is a deep, well drained, moderately sloping to moderately steep soil. It is on foot slopes and benches of hills and mountains. The areas range from about 10 to 150 acres in size.

Typically, the surface layer is dark brown stony loam about 1 inch thick. The subsurface layer is dark brown cobbly loam about 3 inches thick. The subsoil is yellowish red cobbly loam to a depth of about 12 inches; yellowish red cobbly clay loam to a depth of about 36 inches; and red cobbly clay loam to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

Included with this soil in mapping are a few small areas of Enders, Leesburg, Mountainburg, and Steprock soils. Also included are a few small formerly cultivated areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer. Also, in some small included areas, the stones have been removed from the surface.

This soil is not suited to cultivated crops. Runoff is rapid, and erosion is a very severe hazard. Surface stones limit the use of equipment.

The soil is moderately suited to use as pasture. Surface stones limit the use of equipment for haying or brush and weed control. Suitable pasture plants include bermudagrass, tall fescue, white clover, sericea lespedeza, and annual lespedeza. Management concerns include proper stocking, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland (fig. 13). Suitable species include loblolly pine, shortleaf pine, black walnut, white oak, and northern red oak. The use of equipment is moderately limited by large stones on the surface.

The soil is moderately suited to most urban uses. Slope and stones are moderate limitations for dwellings and local roads and streets. The limitations can be mostly overcome by proper engineering design. Slope is a severe limitation for small commercial buildings. Slope, large stones, and the moderate permeability are moderate limitations for septic tank absorption fields. The limitations can be mostly overcome by proper engineering design but may add to the cost.

This soil is in capability subclass VIs and in woodland suitability group 3x8.

33—Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes. These are deep, moderately deep, and shallow, well drained, steep soils on mountainsides. The Nella soil is on narrow, less sloping benches and in pockets in colluvial positions. Steprock and Mountainburg soils are on side slopes above and between benches.

The areas of these soils are so small or so intricately mixed that it was not practical to map them separately. The individual areas of each soil are about 1/4 acre to 5 acres in size. The mapped areas of this complex range from 60 to 1,000 acres in size. The Nella soil makes up about 35 percent of each mapped area, the Steprock soil makes up 35 percent, the Mountainburg soil makes up 20 percent, and other soils and included areas make up 10 percent.

The Nella soil is deep. Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is brown cobbly loam about 3 inches thick. The subsoil is yellowish red cobbly loam to a depth of about 12 inches, yellowish red cobbly clay loam to a depth of about 36 inches, and red cobbly clay loam to a depth of about 72 inches or more.

The Nella soil is low in natural fertility and in content of organic matter. It is very strongly acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

The Steprock soil is moderately deep. Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is yellowish brown very stony loam about 6 inches thick. The subsoil is yellowish red very gravelly loam to a depth of about 11 inches, yellowish red very gravelly clay loam to a depth of about 30 inches, and red, mottled very stony clay loam to a depth of about 36 inches. It is underlain by soft sandstone bedrock.

The Steprock soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. The rooting zone is moderately deep and is easily penetrated by roots.

The Mountainburg soil is shallow. Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is brown stony loam about 4

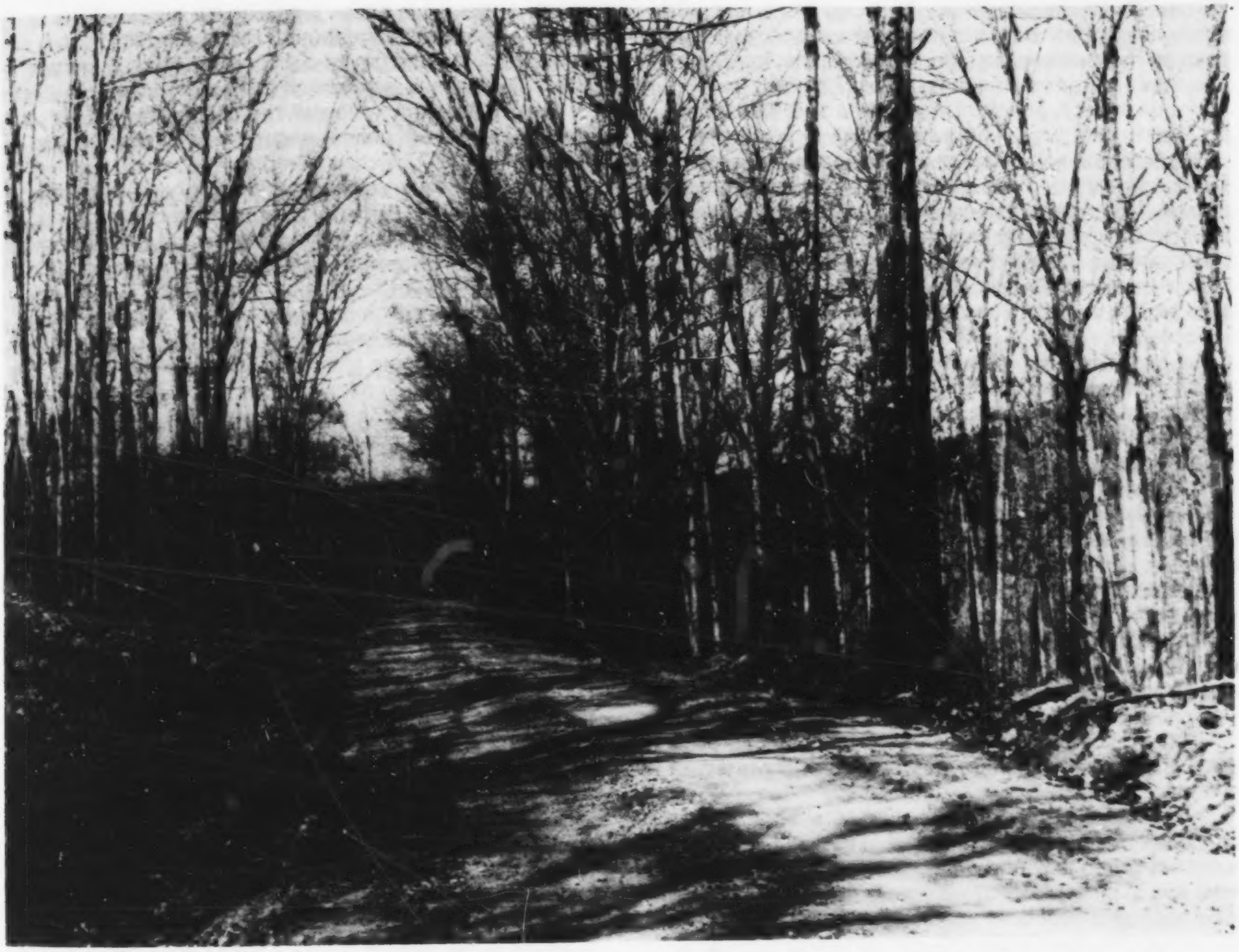


Figure 13.—Well stocked stand of hardwoods on Nella stony loam, 8 to 20 percent slopes, on a bench in the Boston Mountains.

inches thick. The subsoil is yellowish brown very gravelly loam to a depth of about 18 inches. It is underlain by sandstone bedrock.

The Mountainburg soil is low in natural fertility and in content of organic matter. It is medium acid to very strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Permeability is moderately rapid. The soil has a very low available water capacity because of its shallowness to bedrock and high content of rock fragments. The rooting zone is less than 20 inches deep. It is easily penetrated by roots.

Included with these soils in mapping are rock ledges sandstone bluffs, and small areas of Enders and Leesburg soils and soils that have a thick, dark surface layer. Also included are less sloping Nella soils in a few long, narrow areas on benches; these soils commonly have been cleared.

The soils making up this complex are not suited to cultivated crops and are poorly suited to use as pasture. The main limitations are the steep slopes, the large stones on the surface, and the shallowness to rock in areas of the Mountainburg soil. Most areas have a forest cover of upland hardwoods. Erosion is a very severe hazard if the land is cleared. The soils are best suited to use as woodland or habitat for wildlife or to extensive recreation uses.

The Nella soil on slopes facing north and east is well suited to use as woodland. Suitable trees to plant or to foster in existing stands include shortleaf pine, loblolly pine, black walnut, sugar maple, white oak, and northern red oak. The Nella soil on slopes facing south and west is only moderately suited to use as woodland. Suitable trees on those slopes include shortleaf pine, loblolly pine, white oak, and southern red oak. Erosion is a moderate hazard, and the large stones and the slope moderately limit the use of equipment.

The Steprock soil on slopes facing north and east is moderately suited to use as woodland. Adapted species are shortleaf pine, loblolly pine, and eastern redcedar. On slopes facing south and west, this soil is poorly suited to trees. Adapted species are shortleaf pine and eastern redcedar. Erosion is a moderate hazard, and the large stones and the slope moderately limit the use of equipment.

The Mountainburg soil is poorly suited to commercial timber production because the site index is low. Adapted species are shortleaf pine, loblolly pine, and eastern redcedar. Seedling mortality is moderate. Erosion is a severe hazard, and the use of equipment is severely limited.

The soils are poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. On the Steprock soil, the moderate depth to bedrock is also a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome. On the Mountainburg soil, large stones on the surface and shallowness to bedrock are also severe limitations for dwellings, small commercial buildings, roads and streets, and septic tank absorption fields. These limitations are very difficult or impractical to overcome.

The soils are in capability subclass VIIs. The Nella soil on slopes that face north and east is in woodland suitability group 3x9, and on slopes that face south and west it is in group 4x9. The Steprock soil on slopes that face north and east is in woodland suitability group 4x9, and on slopes that face south and west it is in group 5x9. The Mountainburg soil is in woodland suitability group 5x3.

34—Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes. These are deep, moderately deep, and shallow, well drained, very steep soils on mountainsides. The Nella soil is on narrow, less sloping benches and in pockets in colluvial positions. Steprock and Mountainburg soils are on side slopes between benches.

The areas of these soils are so small or so intricately mixed that it was not practical to map them separately. The individual areas of each soil are about 1/4 acre to 5 acres in size. The mapped areas of this complex range from 50 to more than 600 acres in size. The Nella soil makes up about 35 percent of each mapped area, the Steprock soil makes up 35 percent, the Mountainburg soil makes up 15 percent, and other soils and included areas make up 15 percent.

The Nella soil is deep. Typically, the surface layer is brown very stony loam about 1 inch thick. The subsurface layer is brown cobbly loam about 3 inches thick. The subsoil is yellowish red cobbly loam to a depth of about 12 inches; yellowish red cobbly clay loam to a depth of about 36 inches; and red cobbly clay loam to a depth of about 72 inches or more.

The Nella soil is low in natural fertility and in content of organic matter. It is very strongly acid or strongly acid throughout. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

The Steprock soil is moderately deep. Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is yellowish brown very stony loam about 6 inches thick. The subsoil is yellowish red very gravelly loam to a depth of about 11 inches; yellowish red very gravelly clay loam to a depth of about 30 inches; and red, mottled very stony clay loam to a depth of about 36 inches. It is underlain by soft sandstone bedrock.

The Steprock soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. The rooting zone is moderately deep and is easily penetrated by roots.

The Mountainburg soil is shallow. Typically, the surface layer is dark brown very stony loam about 1 inch thick. The subsurface layer is brown stony loam about 4 inches thick. The subsoil is yellowish brown very gravelly loam to a depth of about 18 inches. It is underlain by sandstone bedrock.

The Mountainburg soil is low in natural fertility and in content of organic matter. It is strongly acid or medium acid in the surface layer and very strongly acid or strongly acid in the subsoil. Permeability is moderately rapid. The soil has a very low available water capacity because of its shallowness to bedrock and high content of stones and gravel. The rooting zone is less than 20 inches deep and is easily penetrated by roots.

Included with these soils in mapping are rock ledges, nearly vertical sandstone bluffs, and small areas of Enders and Leesburg soils and of soils that have a thick, dark surface layer. Also included are less sloping Nella soils in a few long, narrow areas on benches.

The soils making up this complex are not suited to cultivated crops or to use as pasture. The main limitations are the very steep slopes, the large stones on the surface, and the shallowness to rock in areas of the Mountainburg soil. Most areas have a forest cover of upland hardwoods. Erosion is a very severe hazard if the land is cleared. The soils are best suited to use as woodland or habitat for wildlife or to extensive recreation uses.

The Nella soil on slopes facing north and east is well suited to use as woodland. Suitable trees to plant or to foster in existing stands include shortleaf pine, loblolly pine, sugar maple, black walnut, white oak, and northern red oak. The Nella soil on slopes facing south and west is only moderately suited to use as woodland. Suitable trees on those slopes include shortleaf pine, loblolly pine, white oak, and southern red oak. Erosion is a severe hazard, and the slope severely limits the use of equipment.

The Steprock soil on slopes facing north and east is moderately suited to use as woodland. Adapted species are shortleaf pine, loblolly pine, and eastern redcedar. On slopes facing south and west, this soil is poorly suited to trees. Adapted species are shortleaf pine and eastern redcedar. Erosion is a severe hazard, and the slope severely limits the use of equipment.

The Mountainburg soil is poorly suited to commercial timber production because the site index is low. Adapted species are shortleaf pine, loblolly pine, and eastern redcedar. Seedling mortality is moderate. Erosion is a severe hazard, and the use of equipment is severely limited.

The soils are poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. On the Steprock soil, the moderate depth to bedrock is also a severe limitation for septic tank absorption fields. These limitations are difficult or impractical to overcome. On the Mountainburg soil, large stones on the surface and shallowness to bedrock are also severe limitations for dwellings, small commercial buildings, roads and streets, and septic tank absorption fields. These limitations are very difficult or impractical to overcome.

The soils are in capability subclass VIIs. The Nella soil on slopes that face north and east is in woodland suitability group 3x9, and on slopes that face south and west it is in group 4x9. The Steprock soil on slopes that face north and east is in woodland suitability group 4x9, and on slopes that face south and west it is in group 5x9. The Mountainburg soil is in woodland suitability group 5x3.

35—Nixa very cherty silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil. It is on narrow ridgetops (fig. 14) and on uplands. The individual areas range from about 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 7 inches. The upper part of the subsoil, to a depth of about 18 inches, is light yellowish brown very cherty silt loam. Below that, to a depth of about 31 inches, there is a yellowish brown, mottled extremely cherty silt loam fragipan. The lower part of the subsoil, below the fragipan, is red, mottled extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate above the fragipan and very slow within the fragipan. The available water capacity is low. The high content of chert fragments makes the soil droughty and tillage difficult. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas of Captina, Clarksville, Noark, and Tonti soils.

This soil is moderately suited to cultivated crops. The high content of chert and the low available water capacity are limitations. Runoff is moderate to rapid, and erosion is a severe hazard if the soil is cultivated. Suitable crops include small grains and forage crops. Under good management that includes erosion control, crops that leave a large amount of residue can be grown year after year. Terraces, contour cultivation, minimum tillage, and grasses and legumes included in the cropping system help reduce runoff, control erosion, and maintain good tilth. Conservation treatment needs to be intensified as the length and gradient of the slope increase.

In cleared areas the soil is used mainly as pasture. It is moderately suited to use as pasture. Suitable pasture plants include tall fescue, white clover, and bermudagrass. The surface chert hinders the use of haying equipment. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, eastern redcedar, and southern red oak. Erosion is only a slight hazard, and equipment limitations are slight. Seedling mortality is moderate.

The soil is moderately suited to most urban uses. There are no significant limitations for dwellings and local roads and streets. Slope is a moderate limitation for small commercial buildings. This limitation can be overcome by proper engineering design and installation. The very slow permeability is a severe limitation for septic tank absorption fields. The limitation can be partly overcome by enlarging the absorption area or by modifying the absorption field.

This soil is in capability subclass IIIs and in woodland suitability group 4f8.

36—Nixa very cherty silt loam, 8 to 15 percent slopes. This is a deep, moderately well drained, moderately sloping to moderately steep soil. It is on long, narrow ridgetops and on uplands. The individual areas range from about 10 to 120 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 7 inches. The upper part of the subsoil, to a depth of about 18 inches, is light yellowish brown very cherty silt

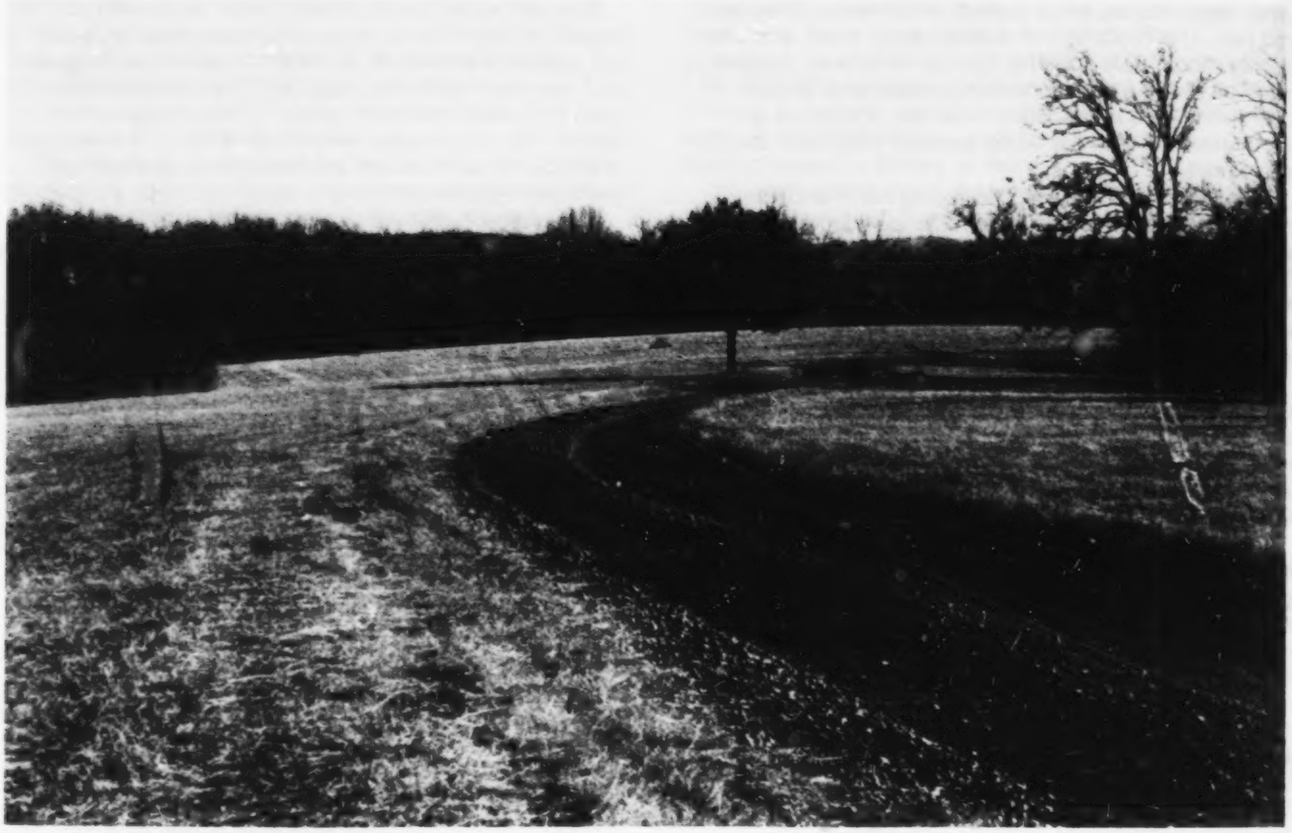


Figure 14.—Nixa very cherty silt loam, 3 to 8 percent slopes, on a ridgetop. The soil is used here mainly as pasture and hayland.

loam. Below that, to a depth of about 31 inches, there is a yellowish brown, mottled extremely cherty silt loam fragipan. The lower part of the subsoil, below the fragipan, is red, mottled extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout. Permeability is moderate above the fragipan and very slow within the fragipan. The available water capacity is low. The high content of chert fragments makes the soil droughty and interferes with tillage operations. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas of Clarksville, Noark, and Tonti soils.

This soil is poorly suited to cultivated crops. The high content of chert and the low available water capacity are limitations. Runoff is rapid, and erosion is a very severe hazard if the soil is cultivated. Suitable crops include small grains and forage crops. Under good management that includes erosion control, clean-tilled and sown crops that leave a large amount of residue can be grown occasionally in a cropping system that includes close-growing cover most of the time. Suitable crops include small grains and forage crops. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

In cleared areas the soil is used as pasture. It is moderately suited to use as pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Surface chert interferes with the use of haying equipment. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, eastern redcedar, and southern red oak. Some wooded areas are publicly owned and are managed as habitat for wildlife. Seedling mortality is moderate.

The soil is moderately suited to poorly suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. These limitations generally can be overcome by proper engineering design and careful installation; however, they may add to the cost of construction. The very slow permeability is a severe limitation for septic tank absorption fields. The limitation can be partly overcome by enlarging the absorption area or by modifying the absorption field.

This soil is in capability subclass IVs and in woodland suitability group 4f8.

37—Noark very cherty silt loam, 8 to 12 percent slopes. This is a deep, well drained, moderately sloping soil. It is on hillsides and narrow ridgetops. The individual areas range from about 10 to 80 acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 6 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 11 inches. The subsoil is strong brown very cherty silt loam to a depth of about 17 inches; yellowish red very cherty clay to about 27 inches; yellowish red, mottled extremely cherty clay to a depth of about 47 inches; and dark red extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are areas of soils that are similar to Noark soils except that they have cherty limestone bedrock at a depth of less than 60 inches and areas of Nixa, Clarksville, and Elsah soils.

The soil is poorly suited to cultivated crops because of the high content of chert and the very severe hazard of erosion. Under good management that includes minimum tillage and contour cultivation, clean-tilled or sown crops can be grown occasionally in a cropping system that utilizes close-growing cover most of the time. Suitable crops include small grains and summer forage crops such as sorghum-sudangrass crosses.

The soil is used mainly as pasture. It is moderately suited to use as pasture. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include loblolly pine, shortleaf pine, eastern redcedar, and southern red oak. Equipment limitations and seedling mortality are moderate.

The soil is moderately suited to most urban uses. Slope is a moderate limitation for dwellings and local roads and streets and a severe limitation for small commercial buildings. The limitations can be overcome by proper engineering design. Slope and the moderate permeability are moderate limitations for septic tank absorption fields, but these limitations can be overcome by good design and careful installation and by enlarging the absorption field.

This soil is in capability subclass VIe and in woodland suitability group 4f8.

38—Noark very cherty silt loam, 12 to 20 percent slopes. This is a deep, well drained, moderately steep soil. It is on hillsides and narrow ridges. The individual areas range from about 10 to 30 acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 6 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 11 inches. The subsoil is strong brown very cherty silt loam to a depth of about 17 inches; yellowish red very cherty clay to a depth of about 27 inches; yellowish red, mottled extremely cherty clay to a depth of about 47 inches; and dark red extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are small areas of Nixa, Clarksville, and Elsah soils. Also included are small areas of soils that are similar to Noark soils except that they are less than 60 inches deep to cherty limestone bedrock.

This soil is not suited to cultivated crops because of the moderately steep slopes, the high content of chert, and the very severe hazard of erosion.

In cleared areas the soil is used mainly as pasture. It is moderately suited to use as pasture. The moderately steep slopes and the high content of chert in the surface layer limit the use of haying equipment. Suitable pasture plants include tall fescue, white clover, lespedeza, and bermudagrass. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include shortleaf pine, eastern redcedar, red oak, and white oak. The use of equipment is moderately limited. Seedling mortality is moderate.

The soil is poorly suited to most urban uses. Slope is a severe limitation for dwellings, small commercial buildings, and local roads and streets. The limitations generally can be overcome by proper engineering design, but it may add to the cost. Slope is a severe limitation for septic tank absorption fields. This limitation generally can be overcome by special design and careful installation.

This soil is in capability subclass VIe and in woodland suitability group 4f8.

39—Noark very cherty silt loam, 20 to 45 percent slopes. This is a deep, well drained, steep to very steep soil. It is on hillsides. The individual areas range from about 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is brown very cherty silt loam to a depth of about 11 inches. The subsoil is strong brown very cherty silt loam to a depth of about 17 inches, yellowish red very cherty clay to a depth of about 27 inches, yellowish red, mottled extremely cherty clay to a depth of about 47 inches, and dark red, extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. The surface layer is slightly acid to strongly acid, and the subsoil is strongly acid or very strongly acid. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are small areas of Clarksville, Nixa, and Elsah soils. Also included in mapping are a few small areas of limestone outcrop and areas of soils that have bedrock at a depth of less than 60 inches but are otherwise similar to Noark soils.

This soil is not suited to cultivated crops and is poorly suited to use as pasture. In a few less sloping areas it is used as pasture, but operation of farm equipment is severely limited by the steep slopes. Erosion is a very severe hazard if the vegetation is removed, although the surface chert lessens potential soil loss. Suitable pasture plants include tall fescue. Weed and brush control is the main concern in management.

This soil is used mainly as woodland. It is moderately suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, eastern redcedar, and southern red oak. Erosion is a moderate hazard. The equipment limitation is severe, and seedling mortality is moderate.

This soil is poorly suited to most urban uses. The steep slopes are a severe limitation for dwellings, local roads and streets, small commercial buildings, and septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability subclass VIIe and in woodland suitability group 4r9.

40—Peridge silt loam, 1 to 3 percent slopes. This is a deep, well drained, nearly level soil. It is on stream terraces and broad uplands. The slopes are smooth and convex. The individual areas range from about 8 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is yellowish red silt loam to a depth of about 13 inches; red silty clay loam to a depth of about 28 inches; red, mottled silty clay loam to a depth of about 50 inches; and yellowish red, mottled silty clay loam to a depth of 72 inches or more.

This soil is moderate in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout, except where the surface layer has been limed. Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are areas where the soils are eroded and plowing mixes the surface layer and the subsoil material, a few shallow gullies, and areas of soils that are similar to Peridge soils except that they have bedrock at a depth of less than 60 inches. Also included are small areas of Captina and Tonti soils.

This soil is well suited to cultivated crops. Suitable crops include corn, soybeans, forage crops, small grains, and truck crops. Erosion is a moderate hazard. Under good management that includes erosion control, clean-tilled crops that leave a large amount of residue can be safely grown year after year. Contour cultivation, minimum tillage, terraces on long slopes, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is mainly used for hay and pasture, to which it is well suited. Suitable pasture and hay plants include tall fescue, white clover, bermudagrass, alfalfa, and lespedeza.

The soil is well suited to use as woodland. Suitable species include loblolly pine, shortleaf pine, southern red oak, and black walnut. There are no significant limitations.

The soil is moderately suited to most urban uses. The limitations for dwellings and small commercial buildings are slight. Low strength is a severe limitation for local roads and streets. This limitation can be overcome by proper engineering design but may add to the cost. The moderate permeability is a moderate limitation for septic tank absorption fields. This limitation can be overcome by enlarging the absorption area or by modifying the filter field itself.

This soil is in capability subclass IIe and in woodland suitability group 3o7.

41—Peridge silt loam, 3 to 8 percent slopes. This is a deep, well drained, gently sloping soil. It is on stream terraces and broad uplands. Slopes are smooth and convex. Individual areas range from about 10 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is yellowish red silt loam to a depth of about 13 inches; red silty clay loam to a depth of about 28 inches; red, mottled silty clay loam to a depth of about 50 inches; and yellowish red, mottled silty clay loam to a depth of 72 inches or more.

This soil is moderate in natural fertility and low in content of organic matter. It is medium acid to very strongly acid throughout unless the area has been limed.

Permeability is moderate, and the available water capacity is high. Tilth is good, and the soil can be worked within a wide range of moisture content. The rooting zone is deep and is easily penetrated by roots.

Included in mapping are areas where the soils are eroded and plowing mixes the surface layer and the subsoil material, a few shallow gullies, and areas of soils that are similar to Peridge soils except that they have bedrock at a depth of less than 60 inches. Also included are small areas of Britwater, Captina, and Tonti soils.

The soil is moderately suited to cultivated crops. Suitable crops include corn, soybeans, forage crops, small grains, and truck crops. Erosion is a severe hazard if cultivated crops are grown. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be safely grown year after year in the less sloping areas. Contour cultivation, terraces, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is well suited to hay and pasture. It is used mainly as pasture. Suitable pasture and hay plants include tall fescue, white clover, bermudagrass, alfalfa, and lespedeza.

The soil is well suited to use as woodland. Suitable species include loblolly pine, shortleaf pine, southern red oak, and black walnut. There are no significant limitations.

The soil is moderately suited to most urban uses. There are no significant limitations for dwellings. Low strength is a severe limitation for local roads and streets. Slope is a moderate limitation for small commercial buildings. These limitations can be overcome by proper engineering design and careful installation procedures but may add to the cost. The moderate permeability is a moderate limitation for septic tank absorption fields, but this can be overcome by enlarging the absorption area or modifying the filter field.

This soil is in capability subclass IIIe and in woodland suitability group 3o7.

42—Secesh gravelly silt loam, occasionally flooded. This is a deep, well drained, level and nearly level soil. It is on flood plains along streams in narrow valleys in the northern part of the county. Slopes are 0 to 3 percent. The areas range from 10 to 100 acres in size.

Typically, the surface layer is dark brown gravelly silt loam about 10 inches thick. The subsoil is dark brown gravelly silt loam to a depth of about 16 inches, reddish brown gravelly silt loam to a depth of about 49 inches, and reddish brown very gravelly silt loam to a depth of 72 inches or more.

This soil is moderate in natural fertility and low in content of organic matter. The surface layer is slightly acid or medium acid, and the subsoil is medium acid to strongly acid. Permeability is moderate, and the available water capacity is medium. The rooting zone is deep and is easily penetrated by roots. The soil has good tilth and can be worked within a wide range of moisture content. In most areas, this soil is flooded for very brief periods by fast-moving water that can cause severe damage very quickly if the soil has no protective plant cover. The floods occur about once every 4 to 10 years, usually between December and June.

Included with this soil in mapping are a few small areas of Elsah, Waben, and Britwater soils, small gravel bars, and narrow overflow channels. Also included are a few small areas of soils that are flooded about once every 2 years.

The soil is well suited to cultivated crops. Suitable crops include corn, soybeans, truck crops, grain sorghum, and forage crops. Flooding is a moderate limitation, and erosion is a moderate hazard. Gravel in the surface layer is a moderate hindrance to tillage. Under good management that includes contour cultivation and minimum tillage, clean-tilled or sown crops that leave a large amount of residue can be safely grown in most years if they are planted after the normal flooding season.

The soil is well suited to use as pasture and hayland, and it is used mainly for hay and pasture. Suitable pasture and hay plants include bermudagrass, tall fescue, alfalfa, johnsongrass, and white clover. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable species include sycamore, sweetgum, cottonwood, and black walnut. There are no significant limitations.

The soil is poorly suited to most urban uses. Occasional flooding is a severe limitation for dwellings, small commercial buildings, local roads and streets, and septic tank absorption fields. Flooding can be prevented only by major flood control measures.

This soil is in capability subclass IIw and in woodland suitability group 3o7.

43—Steprock gravelly loam, 3 to 8 percent slopes. This is a moderately deep, well drained, gently sloping soil. It is on mountaintops and ridgetops. The slopes are smooth and convex. The individual areas range from about 5 to 100 acres in size.

Typically, the surface layer is dark brown gravelly loam to a depth of about 7 inches. The subsoil is yellowish red very gravelly loam to a depth of about 11 inches, yellowish red very gravelly clay loam to a depth of about 30 inches, and red, mottled very gravelly clay loam to a depth of about 36 inches. It overlies soft, thin-bedded sandstone.

Natural fertility and the content of organic matter are low. This soil is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. Gravel is a moderate limitation to cultivation. The rooting zone is moderately deep and is easily penetrated by roots.

Included in mapping are stony spots and small areas where the soils are eroded; shallow gullies have formed in these areas, and some subsoil material has been mixed into the plow layer. Also included are small areas of Enders, Leadvale, Linker, and Mountainburg soils.

This soil is moderately suited to cultivated crops. Runoff is rapid, and erosion is a severe hazard if the soil is cultivated. Suitable crops include soybeans, small grains, and forage crops. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be grown year after year. Terraces, contour cultivation, minimum tillage, and including grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

This soil is mainly used as pasture and hayland. It is well suited to use as pasture. Suitable pasture plants include bermudagrass, tall fescue, white clover, and lespedeza. Proper stocking rate, rotation grazing, and brush and weed control are concerns in management.

This soil is moderately suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar.

This soil is moderately suited to most urban uses. There are no significant limitations for dwellings and local roads and streets. The slope is a moderate limitation for small commercial buildings. This limitation generally can be overcome by proper engineering design. The moderate depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult to overcome.

This soil is in capability subclass IIIe and in woodland suitability group 4o1.

44—Steprock stony loam, 3 to 12 percent slopes. This is a moderately deep, well drained, gently sloping to moderately sloping soil. It is on mountaintops and ridgetops. The slopes are smooth and convex. The individual areas range from about 5 to 60 acres in size.

Typically, the surface layer is dark brown stony loam about 1 inch thick. The subsurface layer is yellowish brown stony loam to a depth of about 7 inches. The subsoil is yellowish red very gravelly loam to a depth of about 11 inches, yellowish red very gravelly clay loam to a depth of about 30 inches, and red, mottled very gravelly clay loam to a depth of about 36 inches. It overlies soft, thin-bedded sandstone.

Natural fertility and the content of organic matter are low. This soil is strongly acid or very strongly acid throughout. Permeability is moderate, and the available water capacity is low. Surface stones restrict the use of farm equipment. The rooting zone is moderately deep and is easily penetrated by roots.

Included in mapping are small areas in which the surface stones have been cleared away and small areas of Enders, Linker, and Mountainburg soils.

This soil is not suited to cultivated crops. Erosion is a very severe hazard if cultivated crops are grown, and surface stones interfere with the use of tillage equipment. Also, this soil is somewhat droughty because of the high content of stones and gravel.

In cleared areas the soil is used mainly as pasture. It is moderately suited to use as pasture. Suitable plants include bermudagrass, tall fescue, white clover, and lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable species include shortleaf pine, loblolly pine, and eastern redcedar. Surface stones moderately limit the use of equipment in woodland management.

This soil is moderately suited or poorly suited to most urban uses. Stones are a moderate limitation for dwellings and local roads and streets. Slope and stones are severe limitations for small commercial buildings. The limitations generally can be overcome by proper engineering design. The moderate depth to bedrock is a severe limitation for septic tank absorption fields. This limitation is difficult or impractical to overcome.

This soil is in capability subclass VIs and in woodland suitability group 4x2.

45—Summit Variant silty clay loam, 3 to 12 percent slopes. This is a deep, moderately well drained, gently sloping and moderately sloping soil. It is on foot slopes. The slopes are smooth and slightly concave. The individual areas are about 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is light olive brown, mottled clay to a depth of about 19 inches and olive brown, mottled clay to a depth of about 56 inches. It is underlain by soft, dark gray shale.

This soil is high in natural fertility and moderate in content of organic matter. The surface layer and the upper part of the subsoil are medium acid to neutral, and the lower part of the subsoil is slightly acid to moderately alkaline. The soil shrinks and cracks in dry spells and expands and seals when it is wet. Permeability is slow, but when the soil cracks, water enters rapidly until the cracks seal. The available water capacity is medium to high. The soil can be worked only within a narrow range of moisture content without clodding. The rooting zone is deep, but the clayey subsoil restricts root penetration. A perched water table is often present late in winter and in spring.

Included with this soil in mapping are a few small areas of Mayes and Enders soils. Also included are a few small areas where flaggy limestone cobbles are on the surface, small areas where the surface layer is silt loam, areas where the soils are eroded, and shale outcrops.

The soil is poorly suited to cultivated crops. Suitable crops include forage crops, soybeans, and small grains. Runoff is rapid, and erosion is a very severe hazard if cultivated crops are grown. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be grown occasionally in a cropping system that uses close-growing cover most of the time. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth. Conservation treatment should be intensified as the length and gradient of the slope increase.

The soil is used mainly as pasture or hayland. It is well suited to use as pasture. Suitable pasture and hay plants include fescue, white clover, bermudagrass, and lespedeza. Proper stocking rate, controlled grazing, and weed and brush control are concerns in management.

The soil is moderately suited to use as woodland. Suitable species include eastern redcedar. Seedling mortality is moderate.

This Summit Variant soil is poorly suited to most urban uses. The high shrink-swell potential is a severe limitation for dwellings, small commercial buildings, and local roads and streets. Low strength is an additional severe limitation for local roads and streets. The limitations generally can be overcome, but they may require special design and impose added engineering and construction costs. The slow permeability and resulting wetness are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

This soil is in capability subclass IVe and in woodland suitability unit 4c8.

46—Summit Variant stony silty clay loam, 12 to 25 percent slopes. This is a deep, moderately well drained, moderately steep to steep soil. It is on foot slopes. The individual areas are about 10 to 20 acres in size.

Typically, the surface layer is very dark grayish brown stony silty clay loam about 10 inches thick. The subsoil is light olive brown, mottled clay to a depth of about 19 inches and olive brown, mottled clay to a depth of about 56 inches. It is underlain by soft, dark gray shale.

This soil is moderate in content of organic matter and high in natural fertility. The surface layer and the upper part of the subsoil are medium acid to neutral, and the lower part of the subsoil is slightly acid to moderately alkaline. The soil shrinks and cracks in dry spells and expands and seals when it is wet. Permeability is slow, but when the soil cracks, water enters rapidly until the cracks seal. The soil can be worked only within a narrow range of moisture content without clodding. The rooting zone is deep, but the clayey subsoil restricts root penetration. A perched water table is often present late in winter and in spring.

Included with this soil in mapping are a few small areas of Moko and Enders soils. Also included are a few small areas that do not have stones on the surface, shale outcrops, areas where the soils are eroded, and small areas where the surface layer is silt loam.

The soil is not suited to cultivated crops. The main limitations are surface stones, rapid runoff, and erosion, which is a very severe hazard if the soil is cultivated.

The soil is poorly suited to use as pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza. The surface stones and the slope hinder the use of mowing equipment, making weed and brush control difficult. Management concerns include proper stocking rate, rotation grazing, and weed and brush control.

The soil is moderately suited to use as woodland. Suitable trees include eastern redcedar. Erosion is a moderate hazard. Seedling mortality is moderate. Surface stones are a moderate limitation to the use of equipment.

The soil is poorly suited to most urban uses. A high shrink-swell potential and slope are severe limitations for dwellings, small commercial buildings, and local roads and streets. Low strength is also a severe limitation for local roads and streets. The limitations generally can be overcome; however, they may necessitate special design, and they add to the cost of construction. The slow permeability, wetness, and slope are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

This soil is in capability subclass VIIs and in woodland suitability group 4c8.

47—Tonti cherty silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained, gently sloping soil. It is on broad uplands. The slopes are smooth and convex. The individual areas range from about 5 to 50 acres in size.

Typically, the surface layer is dark brown cherty silt loam about 7 inches thick. The upper part of the subsoil is yellowish brown cherty silt loam to a depth of about 10 inches and yellowish brown cherty silty clay loam to a depth of about 20 inches. Below that, there is a compact and brittle fragipan of yellowish brown, mottled very cherty silt loam to a depth of about 34 inches. The lower part of the subsoil, below the fragipan, is yellowish red, mottled extremely cherty clay to a depth of about 44 inches and red, mottled extremely cherty clay to a depth of 72 inches or more.

This soil is low in natural fertility and in content of organic matter. It is strongly acid or very strongly acid throughout, except where the surface layer has been limed. Permeability is slow, and the available water capacity is medium. Tilth is good, and the soil can be worked within a wide range of moisture content. Surface chert is a slight hindrance to tillage operations. There is a perched water table above the fragipan late in winter and early in spring. The fragipan restricts root penetration and slows the movement of water through the soil.

Included with this soil in mapping are small areas of Captina, Nixa, and Noark soils and a few small areas where the soils are eroded and subsoil material is mixed into the plow layer.

The soil is moderately suited to cultivated crops. Runoff is medium to rapid, and erosion is a severe hazard if cultivated crops are grown. Suitable crops include small grains, forage crops, soybeans, and truck crops. Under proper management that includes erosion control, clean-tilled crops that leave a large amount of residue on the surface can be safely grown year after year. Terraces, contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

The soil is used mainly as pasture and hayland. It is well suited to use as pasture. Suitable pasture plants include tall fescue, white clover, bermudagrass, and lespedeza.

The soil is moderately suited to use as woodland. Suitable species include shortleaf pine, southern red oak, and eastern redcedar. There are no significant concerns in management.

The soil is moderately suited to most urban uses. Wetness and slope are moderate limitations for small commercial buildings. Wetness is a moderate limitation for dwellings and local roads and streets. These limitations can be overcome by proper engineering design and drainage. The slow permeability and wetness are severe limitations for septic tank absorption fields. The limitations can be largely overcome by enlarging the absorption area and by modifying the absorption field.

This soil is in capability subclass IIIe and in woodland suitability group 4o7.

48—Waben very cherty silt loam, 3 to 12 percent slopes. This is a deep, well drained, gently sloping to moderately sloping soil. It is on stream terraces, alluvial fans, and foot slopes. The individual areas range from about 5 to 20 acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 8 inches thick. The subsoil is dark yellowish brown very cherty silt loam to a depth of about 13 inches; strong brown very cherty silt loam to a depth of about 30 inches; strong brown, mottled very cherty silt loam to a depth of about 57 inches; and brown, mottled extremely cherty silt loam to a depth of 72 inches or more.

Natural fertility and the content of organic matter are low. The soil is medium acid or strongly acid throughout. Permeability is moderately rapid, and the available water capacity is low. Tilth is good, and the soil can be worked within a wide range of moisture content. The high content of chert makes tillage operations difficult. The rooting zone is deep and is easily penetrated by roots. Deep-rooted plants can reach and absorb seepage water.

Included in mapping are small areas of Britwater, Elsah, Nixa, and Secesh soils and narrow escarpments.

The soil is moderately suited to cultivated crops. Erosion is a moderate to severe hazard if cultivated crops are grown, and surface chert hinders tillage. The high content of chert also makes this soil somewhat droughty except for deep-rooted plants. Suitable crops include small grains and cultivated forage crops such as sorghum-sudangrass hybrids. Under good management that includes erosion control, clean-tilled or sown crops that leave a large amount of residue can be safely grown in a cropping system that includes close-growing cover part of the time. Contour cultivation, minimum tillage, and the use of grasses and legumes in the cropping system help reduce runoff, control erosion, and maintain good tilth.

This soil is well suited to use as pasture. In cleared areas it is used mainly as pasture. Surface chert interferes with the use of some haying equipment. Suitable pasture plants include bermudagrass, tall fescue, white clover, and annual lespedeza. Management concerns include proper stocking rate, controlled grazing, and weed and brush control.

The soil is well suited to use as woodland. Suitable trees include shortleaf pine, loblolly pine, redcedar, and southern red oak. Seedling mortality is moderate.

The soil is well suited to most urban uses. The limitations for dwellings, local roads and streets, and septic tank absorption fields are slight. Slope is a moderate limitation for small commercial buildings. The limitation generally can be overcome by proper engineering design.

This soil is in capability subclass IIIs and in woodland suitability group 3f8.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Madison County are listed.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. The soils that make up prime farmland have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be long enough. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may now be in use as cropland, pasture, woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

On prime farmland, the moisture supply from precipitation or irrigation is adequate and dependable. The temperature and growing season are favorable, and the acidity or alkalinity level of the soils is acceptable. There are few or no rocks. The soils are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 8 percent.

Soils that have a seasonal perched water table, are subject to flooding, or are droughty may qualify as prime farmland if the limitations and hazards are overcome by drainage, flood control, or irrigation. Detailed information on the criteria for prime farmland can be obtained from the local office of the Soil Conservation Service.

In Madison County, about 37,365 acres, or about 7 percent of the county, is prime farmland. The prime farmland soils are on broad uplands near Hindsville and Clifty, throughout the central and southern parts of the county on gently sloping mountaintops and plateaus, and on flood plains and terraces along White River, Kings River, War Eagle Creek, and smaller tributary streams. The soils are mainly in map units 2, 4, and 7 of the general soil map. Most of the acreage is used as pasture or hayland, but a significant amount is used for various cultivated crops.

Recently, a modest acreage of prime farmland in Madison County has been converted to urban uses or subdivided into small estates, especially around the town of Huntsville and in strips along major roads. The loss of prime farmland to other uses puts pressure on marginal land, which generally is less productive because it is more erodible, droughty, and difficult to cultivate.

The following map units, or soils, make up prime farmland in Madison County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

1	Allen loam, 3 to 8 percent slopes
5	Britwater gravelly silt loam, 3 to 8 percent slopes
6	Captina silt loam, 1 to 3 percent slopes
10	Cleora fine sandy loam, occasionally flooded
17	Healing silt loam, 1 to 3 percent slopes
18	Johnsburg silt loam, 0 to 1 percent slopes
20	Leesburg gravelly loam, 3 to 8 percent slopes
23	Linker loam, 3 to 8 percent slopes
24	Mayes silty clay loam, 0 to 1 percent slopes
29	Nella gravelly loam, 3 to 8 percent slopes
40	Peridge silt loam, 1 to 3 percent slopes
42	Secesh gravelly silt loam, occasionally flooded

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 33 percent of Madison County, or about 178,130 acres, was used for pasture, hayland, or forage crops in 1978, according to an unpublished inventory made by the Soil Conservation Service. About 6 percent of the county, or about 30,582 acres, was classed as harvested cropland. Of this acreage, less than 2,000 acres was in cultivated row crops. The rest was mainly hayland, but a small acreage was in cultivated forage crops. The rest of the county was mainly woodland.

Crops

The acreage of cultivated crops in the county is small. Generally, crops are sown or drilled and not cultivated. The soils that are well suited and moderately suited to row crops are mainly on bottomlands and terraces along the larger streams, on terraces above the flood plain along smaller streams, and in nearly level and gently sloping areas on broad uplands and mountaintops. Suitable crops for these soils are soybeans, corn, small grains, grain sorghums, truck crops, orchard fruit, and forage crops, for example, sorghum-sudangrass hybrids. Some gently sloping and moderately sloping soils on uplands are poorly suited to clean-tilled crops. They are better suited to sown or drilled crops, such as wheat, grain sorghum, and such forage crops as sorghum-sudangrass hybrids.

Commercial and home orchards, home gardens, and truck patches make up a small acreage. Although the cash income produced is also small, these enterprises are important. Most farm families and many urban families preserve and freeze homegrown fruit and vegetables for their own use. Specialty crops, such as watermelons, strawberries, tomatoes, blueberries, blackberries, and sweet corn, are grown to be sold at farmers' markets or directly from the farm.

Most soils in the county are not suited to cultivated crops because of stones on the surface, slope, frequent flooding, shallowness to bedrock, a high content of coarse fragments, or a combination of these limitations.

Contour cultivation, grassed waterways, minimum tillage, and terraces are needed on sloping soils that are used for tilled crops. Annual cover crops or grasses and legumes should be grown regularly in the cropping system if the hazard of erosion is severe or very severe or if the main-season crops leave only a small amount of residue.

Most of the soils tend to pack and crust over after heavy rains if they are left without vegetative protection. Growing cover crops, including grasses and legumes in the crop rotation, and managing crop residue help to maintain good tilth. Crop residue should be shredded and spread evenly to provide a protective cover and add organic matter to the soil. Minimum tillage should be practiced to the extent practical for the soil conditions and the needs of the crop.

In general, the soils on uplands are low in nitrogen, potassium, phosphorus, calcium, and organic matter. The kinds and amounts of fertilizer applied generally are based on soil tests, crops to be grown, past experience, capability of the soil to produce, and expected yields. On most soils, lime applied as indicated by soil tests helps most crops, and it is generally necessary for satisfactory yields of such crops as alfalfa, white clover, red clover, vegetables, and other specialty crops.

Pasture

Most of the openland in Madison County is used as pasture or hayland. A large part of the hayland is also grazed part of the time.

Perennial grasses or mixtures of grasses and legumes are commonly grown for pasture and hay. Mixtures generally consist of a warm-season or cool-season grass and a legume.

Tall fescue, a cool-season perennial grass, is the principal pasture grass grown in the county. It is propagated by seeding and is well suited to most of the soils in the county. It is also harvested for hay and sometimes for seed. Orchardgrass and smooth bromegrass, also cool-season perennials, are grown to a limited extent, primarily for hay.

Common bermudagrass and hybrid bermudagrass are the warm-season perennial grasses most commonly grown in the county for pasture and hay. They are generally propagated by sprigging. Stands of common bermudagrass started from seed are susceptible to winterkill.

White clover and annual lespedeza are the primary pasture legumes. A native legume, low hopclover, is also present in many stands. These legumes are usually grown as part of a grass-legume mixture.

Alfalfa, red clover, and johnsongrass are also grown, primarily for hay. They are best suited to deep, fertile, well drained soil. Sorghum-sudangrass hybrids are grown for supplemental summer grazing. Fall-sown small grains are sometimes used for supplemental cool-season grazing.

Pasture Management and Maintenance

Proper grazing is essential for the production of high-quality forage, for stand survival, and for erosion control. It helps plants maintain sufficient top growth during the growing season for reproduction and renewed vigor. Grazing of tall fescue and other cool-season grasses needs to be restricted during the hot, dry summer months. Brush control is essential, and weed control generally is needed. Rotation grazing and renovation are also important in pasture management.

Pasture grasses respond especially well to nitrogen fertilizer in addition to phosphate, potash, and lime if it is needed. Grass and legume mixtures, in comparison, may require more phosphate, potash, and lime and less nitrogen. Rates of application should be based on current soil test results of nutrient needs. The large quantity of manure and litter produced by the poultry industry in Madison County is a relatively inexpensive source of plant nutrients. Most of it is recycled by being spread over grassland. Overapplication should be avoided, as it can create an imbalance among the plant nutrients and contribute to pollution of local streams and water sources.

Using a combination of cool-season and warm-season grasses lengthens the grazing season. A common management practice is to reserve cool-season grass pasture for grazing after frost in order to reduce winter feeding of livestock.

A considerable acreage of pasture and rangeland in Madison County consists of soils that are rolling to steep and have a stony or very cherty surface. These soils generally have low natural fertility. They also have limitations to the use of equipment which make applying fertilizer, as well as controlling brush and weeds, very difficult. Recently, it has become a common practice to use aircraft in applying herbicides for brush and weed control and in seeding and fertilizing to establish or maintain permanent pasture on these soils. This new method has made it practical and increasingly common to convert areas of similar soils from woodland to pasture, especially in periods when livestock prices are favorable. On some of these soils, erosion is potentially a severe hazard if the pasture is overgrazed. Special management is needed to maintain an adequate plant cover to control erosion. On shallow, sloping to very steep soils that have a low or very low available water capacity, the most practical cover may be one of native grasses and forbs. The plants on such soils cannot utilize large amounts of fertilizer, nor can they withstand more than very limited grazing. Mountainburg soils are an example.

Development of a well distributed livestock water supply is a management tool to prevent overgrazing near water (fig. 15). About 3,700 ponds in the county furnish water for livestock, and many are stocked with fish.

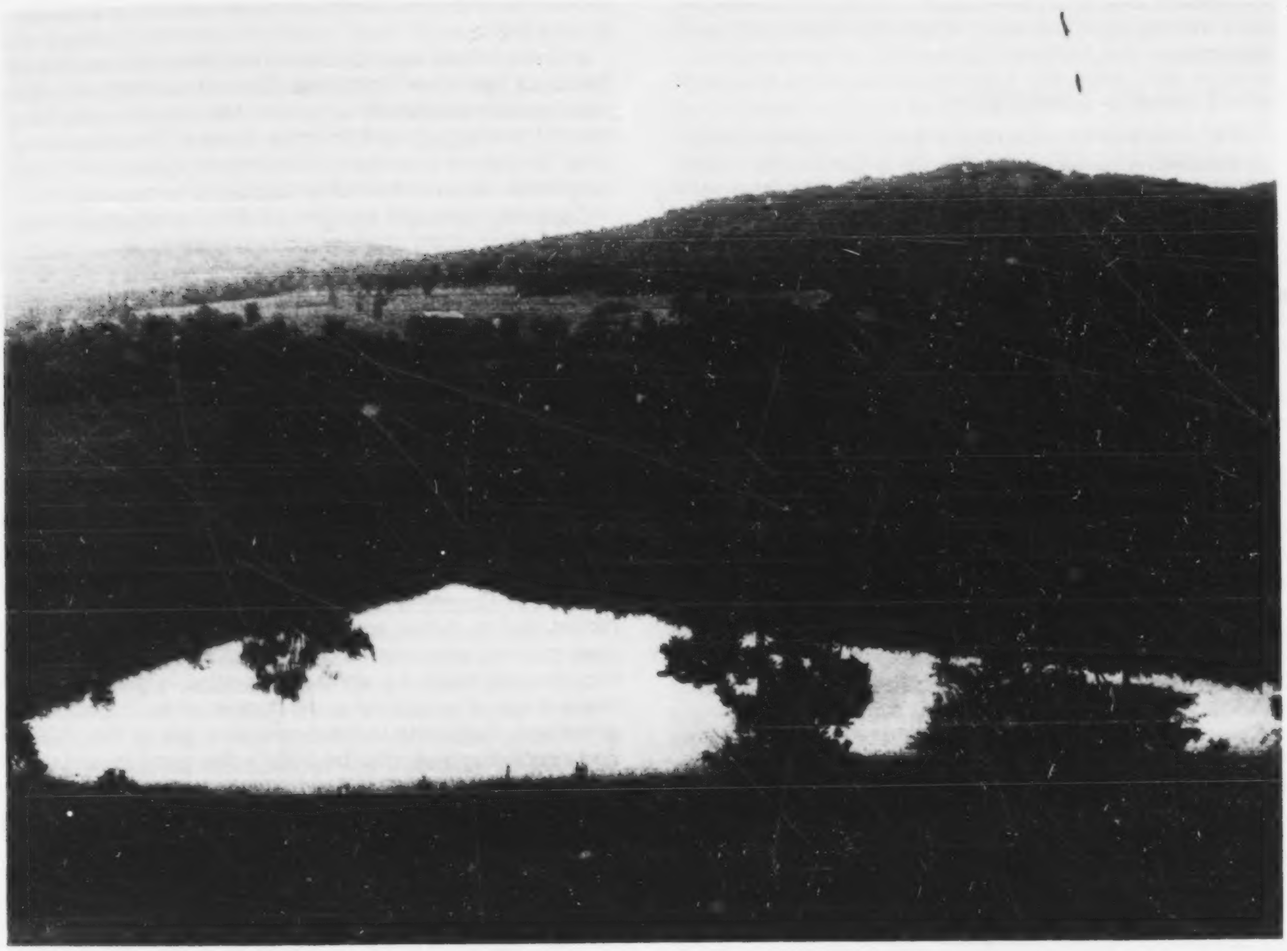


Figure 15.—Livestock watering pond in an area of Noark very cherty silt loam, 8 to 12 percent slopes.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the

Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

Kelly M. Koonce, forester, Soil Conservation Service, helped prepare this section

Madison County was originally covered with oak-hickory forest. A few scattered prairies and stands of pine and redcedar were interspersed among the broadleaved trees. As white men settled in the region, many areas of woodland were converted to cropland or grassland. Beginning in the depression era of the 1930's and continuing well into the 1950's the trend in land use was to allow cropland and grassland to revert to forest. In 1959, according to a survey made by the United States Forest Service (*12*), 76 percent of the county was in forest. A similar survey made in 1969 showed that 46,000 acres had been converted from forest to pastureland and 66 percent of the county was timbered. In 1978, according to an unpublished inventory made by the Soil Conservation Service, 61 percent of the county was in forest.

The quality of the commercial forests ranges from good to poor. Generally, the better stands are on deep soils and on moderately deep soils on slopes facing north or east. Broadleaved tree species dominate the forest; however, there are also scattered stands of needleleaved trees.

There are 18 wood products mills in Madison County. The mills are small in size, and most of them turn out novelty or craft items. Even so, the wood products industry helps the general economic picture. Wood products include lumber, furniture stock, crossties, fenceposts, handles, and barrel staves. The production of fuelwood is an important and growing business.

The natural beauty of the Ozark highlands and the Boston Mountains forest contributes significantly to esthetic and recreational values in Madison County. The forests also provide habitat for wildlife and aid in soil and water conservation.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the woodland suitability group symbol for each soil. Soils assigned the same woodland suitability group symbol require the same general management and have about the same potential productivity.

The first part of the *symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, d, c, s, f, and r.

The third element in the symbol, a numeral, indicates the kind of trees to which the soils in the group are best suited and also indicates the severity of the hazard or limitation. The numerals 1, 2, and 3 indicate slight, moderate, and severe limitations, respectively, and suitability for needleleaved trees. The numerals 4, 5, and 6 indicate slight, moderate, and severe limitations, respectively, and suitability for broadleaved trees. The numerals 7, 8, and 9 indicate slight, moderate, and severe limitations, respectively, and suitability for both needleleaved and broadleaved trees.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Paul Brady, biologist, Soil Conservation Service, helped prepare this section.

About 61 percent of the county, or 326,276 acres, is forested. This total includes 47,861 acres that are part of the Ozark National Forest. Roughly 80 percent of the forest is hardwoods (oak-hickory climax on uplands, oak-sweetgum climax on lowlands), and about 20 percent is shortleaf pine and eastern redcedar.

About 33 percent of the county, or 178,130 acres, is pasture, hayland, and forage areas. Tall fescue is the principal pasture grass. Other important grasses are orchardgrass, smooth bromegrass, and common and hybrid bermudagrasses. White clover and annual lespedeza are the primary pasture legumes. Alfalfa, red clover, and johnsongrass are also grown, primarily for hay.

The 30,582 acres of harvested cropland in the county is mainly in hay and forage crops. Less than 2,000 acres is in a variety of cultivated crops, including corn, small grains, grain sorghums, truck crops, orchard fruit, and various specialty crops, such as tomatoes and blueberries.

Some native plants of major importance to wildlife in Madison County are woolly croton, annual lespedeza, milkpea, panicgrasses, partridgepea, paspalums, common ragweed, tickclover, vetches, and such woody plants as oaks, hickories, hackberry, shortleaf pine, redcedar, elderberry, grapes, dogwoods, blackberry, greenbriers, persimmon, wild cherry, sumacs, and the naturalized invader, Japanese honeysuckle.

The abundant hardwood forests, interspersed pastures, fencerows, and numerous edges provide plentiful habitat for white-tailed deer, squirrels, bobwhite quail, wild turkey, raccoons, coyotes, skunks, opossums, foxes, rabbits, owls, hawks, numerous songbirds and insectivorous birds, small mammals, reptiles, and other wildlife. Red-tailed hawks have increased in number. The populations of squirrels, deer, and quail are relatively high. In recent years, a large increase in the skunk and coyote population has been noted.

The estimated 1,200 acres of ponds in the county, which are used primarily as watering places for livestock, also furnish sport fishing for largemouth bass, bluegills, redear sunfish, and channel catfish.

About 161 miles of fishable streams are in the county. The largest and most important streams are the Kings River, War Eagle Creek, and the White River. The streams provide habitat for Kentucky bass, smallmouth bass, rock bass, brown bass, longear sunfish, green sunfish, white sucker, sculpins, various minnows, shiners, darters, and other cool-water species and species found in waters transitional from cool to warm water.

The scenic and, up to this time, very clean streams in Madison County have received increasing amounts of organic pollutants in recent years. The increase in nitrates is especially significant.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, cherry, sweetgum, apple, grapes, hawthorn, dogwood, hickory, and blackberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and redcedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

James L. Janski, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Sanitary Facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*11*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 15 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 15.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 16 and the results of chemical analysis in table 17. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the University of Arkansas, Fayetteville, Arkansas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are as follows.

The silt and clay particle size distribution was determined by the hydrometer method (*6*). Sands were measured by sieving (*13*).

Organic carbon was determined by the dry combustion method, which measures $C0^2$ evolution gravimetrically (*13*). The percentage of organic matter was then determined by multiplying the percentage of organic carbon by 1.72.

Soil pH was determined on 1:1 soil to water mixture.

The bases were extracted with 1*N*, pH 7.0, ammonium acetate. Calcium, potassium, and sodium were determined with a flame photometer, and magnesium was measured by atomic absorption. The extractable acidity was determined by the barium chloride-triethanolamine method (*13*).

The total of the extractable calcium, potassium, magnesium, and sodium and the extractable acidity is an approximation of the cation exchange capacity of the soil. Except in soils that contain soluble salts, base saturation was determined by dividing this total into the sum of calcium, potassium, magnesium, and sodium and then multiplying by 100.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*14*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udults*, the suborder of the Ultisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, siliceous, mesic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*11*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*14*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Allen Series

The Allen series consists of deep, well drained, moderately permeable soils. The soils are gently sloping. They are on stream terraces and broad upland flats. The soils formed in old alluvium derived mainly from sandstone, siltstone, and shale. The native vegetation was upland hardwood forest. The slope is 3 to 8 percent.

Allen soils are near Leadvale, Cleora, Healing, and Nella soils. Leadvale soils are on adjacent similar slopes; unlike Allen soils, they have a fragipan. Cleora soils are on flood plains; they do not have an argillic horizon, and they have a coarse-loamy control section. Healing soils are on low terraces; they have a mollic epipedon and have higher base saturation in the argillic horizon than Allen soils. Nella soils are on foot slopes and benches; they are more than 15 percent coarse fragments in the surface layer and the argillic horizon.

Typical pedon of Allen loam, 3 to 8 percent slopes, in a pasture in the SW1/4SE1/4SE1/4 sec. 24, T. 17 N., R. 26 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; friable; many fine roots; many fine pores; slightly acid; clear smooth boundary.

BE—7 to 11 inches; strong brown (7.5YR 5/6) loam; weak medium subangular blocky structure; friable; many fine roots; common fine pores; strongly acid; clear smooth boundary.

Bt1—11 to 19 inches; red (2.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; few fine roots; common fine pores; thin continuous clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—19 to 39 inches; red (2.5YR 4/6) clay loam; common medium prominent yellowish brown (10YR 5/4) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; thin continuous clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—39 to 55 inches; red (2.5YR 4/6) clay loam; common medium distinct strong brown (7.5YR 5/6) and common medium prominent pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt4—55 to 72 inches; red (2.5YR 4/6) clay loam; common fine distinct strong brown (7.5YR 5/6) and few fine prominent pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; thin continuous clay films on faces of peds; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 72 inches. Reaction is strongly acid to very strongly acid throughout, except in the Ap horizon where the soil has been limed.

The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4, and chroma of 3 or 4, or it has value of 5 and chroma of 3. The content of sandstone gravel ranges from 0 to 10 percent by volume.

The BE horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6.

The Bt horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 2.5YR, value of 3 or 4, and chroma of 6. The lower part of the Bt horizon has mottles in shades of brown. The texture is loam or clay loam. The content of sandstone gravel ranges from 0 to 15 percent by volume.

Arkana Series

The Arkana series consists of moderately deep, well drained, very slowly permeable soils that formed in clayey residuum of cherty limestone or cherty dolomitic limestone bedrock. The soils are moderately sloping to steep. They are on the lower slopes hillsides and on ridges. The native vegetation was mixed hardwoods and redcedar. The slope is 8 to 40 percent.

Arkana soils are near Clarksville and Moko soils. Clarksville soils are in higher positions on hillsides than Arkana soils; they are more than 60 inches deep to bedrock and have a loamy-skeletal control section. Moko soils are on adjacent similar landscapes; they are less than 20 inches deep to bedrock and do not have an argillic horizon.

Typical pedon of Arkana very cherty silt loam, in an area of Arkana-Moko complex, 20 to 40 percent slopes, in the NW1/4NE1/4NW1/4 sec. 20, T. 19 N., R. 25W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; moderate medium granular structure; friable; 40 percent, by volume, chert fragments 1 inch to 5 inches in diameter; slightly acid; clear wavy boundary.

Bt1—7 to 12 inches; reddish brown (5YR 4/4) cherty clay; weak fine subangular and angular blocky structure; firm; thin continuous clay films on faces of peds; 30 percent, by volume, chert fragments 0.5 inch to 4 inches in diameter; neutral; clear wavy boundary.

Bt2—12 to 24 inches; yellowish red (5YR 4/6) cherty clay; weak fine subangular and angular blocky structure; firm; thin continuous clay films on faces of peds; 30 percent, by volume, chert fragments 0.5 inch to 4 inches in diameter; neutral; clear wavy boundary.

Bt3—24 to 32 inches; brown (7.5YR 5/4) clay; many coarse faint strong brown (7.5YR 5/6) mottles; weak angular blocky structure; firm, plastic; thin and medium continuous clay films on faces of peds; 10 percent, by volume, chert and limestone fragments 0.5 inch to 4 inches in diameter; mildly alkaline; abrupt irregular boundary.

R—32 to 40 inches; hard, level-bedded limestone; few cracks and fractures more than 4 inches apart; cracks filled with soil material from above.

The solum is 20 to 40 inches thick. The A horizon ranges from medium acid to mildly alkaline, and the Bt horizon ranges from strongly acid to moderately alkaline.

The A horizon is 5 to 12 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The content of chert fragments ranges from 35 to 60 percent by volume.

In some pedons there is an E horizon. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is cherty silt loam or very cherty silt loam. Chert fragments make up 15 to 50 percent of the volume.

The Bt1 and Bt2 horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 4 or 6. The Bt1 horizon is cherty silty clay or cherty clay. The content of coarse fragments ranges from 20 to 60 percent. The Bt2 and Bt3 horizons are clay or cherty clay. The content of coarse fragments ranges from 0 to 35 percent. The Bt3 horizon has matrix colors in hue of 10YR, 7.5YR, or 5YR, value of 4, 5, or 6, and chroma of 4 or 6. It commonly is mottled in shades of brown or yellow.

The R horizon is hard, level-bedded, fractured limestone or dolomite that contains resistant chert.

Britwater Series

The Britwater series consists of deep, well drained, moderately permeable, gently sloping soils that formed in loamy, old alluvial sediment washed mainly from limestone uplands. The soils are on stream terraces and narrow colluvial benches. The native vegetation was mixed hardwoods. The slope is 3 to 8 percent.

Britwater soils are near Elsah, Peridge, Secesh, and Waben soils. Elsah soils are on flood plains; they do not have an argillic horizon, and they have a loamy-skeletal control section. Peridge soils are on adjacent similar landscapes; they have a fine-silty control section and contain less gravel than Britwater soils. Secesh soils are on adjacent lower lying flood plains; they have a mollic surface layer and siliceous mineralogy. Waben soils are on adjacent similar landscapes; they have a loamy-skeletal control section and siliceous mineralogy.

Typical pedon of Britwater gravelly silt loam, 3 to 8 percent slopes, in a meadow in the NW1/4SE1/4SE1/4 sec. 15, T. 17 N., R. 26 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) gravelly silt loam; moderate medium granular structure; friable; many roots; about 20 percent, by volume, chert gravel as much as 3 inches across; medium acid; clear smooth boundary.

BE—7 to 16 inches; yellowish brown (10YR 5/4) gravelly silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; many fine and medium pores; about 25 percent, by volume, chert gravel; strongly acid; clear wavy boundary.

Bt1—16 to 36 inches; yellowish red (5YR 4/6) gravelly silty clay loam; moderate medium subangular blocky structure; firm; thin patchy clay films; about 30 percent, by volume, chert gravel; strongly acid; gradual wavy boundary.

Bt2—36 to 72 inches; yellowish red (5YR 4/8) very gravelly silty clay loam; many coarse prominent light yellowish brown (10YR 6/4) mottles; moderate medium angular blocky structure; firm; common fine and medium roots; many fine and medium pores; thin continuous clay films; about 40 percent, by volume, chert gravel; strongly acid.

The solum is 60 to more than 80 inches thick. Reaction is medium acid or strongly acid throughout.

The Ap horizon is 5 to 8 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The content of gravel ranges from 15 to 30 percent.

The BE horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The content of gravel ranges from 15 to 25 percent.

The Bt1 horizon has hue of 5YR, value of 4, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 6. The texture is silt loam or silty clay loam and the gravelly analogs. The content of gravel ranges from 15 to 30 percent.

The Bt2 horizon has hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8 and is mottled in shades of brown. The texture is silty clay loam or silty clay and the gravelly or very gravelly analogs. The content of gravel ranges from 25 to 45 percent.

Captina Series

The Captina series consists of deep, moderately well drained, slowly permeable, nearly level soils that formed in loamy material overlying cherty limestone or siltstone. The soils are on broad upland flats and stream terraces. The native vegetation was mixed upland hardwoods. The slope is 1 to 3 percent.

Captina soils are near Nixa, Tonti, Noark, Peridge, and Johnsburg soils. Nixa soils are on adjacent ridgetops; they are very cherty throughout and have a loamy-skeletal control section. Tonti soils are on adjacent slopes; they have a cherty surface layer and a fine-loamy control section. Noark soils are on adjacent steeper side slopes; they have a clayey-skeletal control section and do not have a fragipan. Johnsburg soils are in slight depressions; they are somewhat poorly drained and have gray mottles in the upper part of the Bt horizon. Peridge soils are on adjacent similar landscapes; they do not have a fragipan.

Typical pedon of Captina silt loam, 1 to 3 percent slopes, in a pasture in the SW1/4NW1/4NE1/4 sec. 9, T. 17 N., R. 27 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; many fine roots; few fine chert fragments; medium acid; abrupt smooth boundary.

Bt—7 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; few fine gravel-sized chert fragments; thin patchy clay films on ped faces; strongly acid.

Btx1—20 to 38 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) silty clay loam; common streaks of gray as much as 0.7 inches wide; moderate fine subangular and angular blocky structure; firm; brittle; 5 percent, by volume, chert gravel; thin patchy clay films on ped faces; very strongly acid; gradual wavy boundary.

Btx2—38 to 52 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) very cherty silty clay loam; common streaks of gray as much as 0.7 inches wide; moderate fine subangular and angular blocky structure; firm; brittle; 40 percent, by volume, chert gravel; thin patchy clay films on ped faces; very strongly acid; gradual wavy boundary.

B't—52 to 72 inches; red (2.5YR 4/6) extremely cherty clay; many coarse prominent pale brown (10YR 6/3) mottles; moderate fine and medium angular blocky structure; firm; 65 percent, by volume, chert fragments [illegible] inch to 6 inches in diameter; medium continuous clay films; very strongly acid.

The depth to the fragipan ranges from 17 to 25 inches. The thickness of the solum and the depth to consolidated bedrock are more than 72 inches. The A horizon ranges from slightly acid to strongly acid, and the B horizon is strongly acid or very strongly acid.

The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4, and chroma of 2 or 3, or it has value of 5 and chroma of 3.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is silt loam or silty clay loam.

The Btx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is mottled in shades of gray, brown, and red. It is silt loam or silty clay loam and the cherty or very cherty analogs. The content of chert ranges from 0 to 15 percent in the Btx1 horizon and 10 to 50 percent in the Btx2 horizon.

The B't horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 6 or 8 and is mottled in shades of brown or gray. It is very cherty silty clay, very cherty clay, extremely cherty silty clay, or extremely cherty clay. The content of chert ranges from 50 to 75 percent in the B't horizon. In some places the chert is in the form of rippable cherty limestone beds that have red clay in cracks and crevices.

Ceda Series

The Ceda series consists of deep, well drained, rapidly permeable, level and nearly level soils on the flood plain of small streams in narrow valleys. The soils formed in gravelly and cobbly, loamy sediment that washed from uplands of weathered sandstone, siltstone, and shale. The native vegetation was mixed hardwood trees. The slope is 0 to 3 percent.

Ceda soils are near Cleora, Enders, Leesburg, and Nella soils. Cleora soils are also on flood plains, but they are mainly along larger streams and are farther from the stream than Ceda soils. Cleora soils have a coarse-loamy control section. Enders soils are on adjacent higher side slopes; they have an argillic horizon and a clayey control section. Leesburg and Nella soils are on adjacent higher terraces and foot slopes; they have an argillic horizon and a fine-loamy control section.

Typical pedon of Ceda cobbly fine sandy loam, frequently flooded, in the NW1/4NW1/4SW1/4 sec. 23, T. 16 N., R. 24 W.

A1—0 to 6 inches; dark brown (10YR 3/3) cobbly fine sandy loam; moderate medium granular structure; very friable; many fine and medium roots; about 15 percent, by volume, rounded sandstone cobbles and 10 percent gravel; medium acid; clear smooth boundary.

A2—6 to 15 inches; dark brown (10YR 3/3) cobbly fine sandy loam; moderate medium granular structure; very friable; many fine and common medium roots; about 25 percent, by volume, rounded sandstone cobbles; medium acid; clear smooth boundary.

C1—15 to 30 inches; brown (10YR 4/3) very cobbly fine sandy loam; massive; friable; common fine and medium roots; about 20 percent, by volume, rounded sandstone gravel and 35 percent rounded cobbles; medium acid; clear wavy boundary.

C2—30 to 58 inches; brown (10YR 5/3) very gravelly fine sandy loam; massive; friable; few fine and common medium roots; about 50 percent, by volume, sandstone gravel; common thin strata of sand and fine gravel; medium acid; gradual wavy boundary.

C3—58 to 72 inches; brown (10YR 4/3) very gravelly loam; massive; friable; about 35 percent, by volume, rounded sandstone gravel; medium acid.

The loamy sediment is 60 to more than 72 inches thick. Reaction is slightly acid or medium acid throughout.

The A horizon is 7 to 16 inches thick. It has hue of 10YR, value of 3, 4, or 5, and chroma of 2 or 3. It is cobbly fine sandy loam or gravelly fine sandy loam. Coarse fragments make up 15 to 35 percent of the volume.

The C horizon has hue of 10YR and value of 4 or 5 and chroma of 3 to 6; or it has hue of 7.5YR and value of 4 and chroma of 4 or value of 5 and chroma of 6. It is loam, fine sandy loam, or clay loam and the gravelly, very gravelly, cobbly, or very cobbly analogs. The average content of coarse fragments ranges from 35 to 75 percent, by volume, except in some thin strata where the average is less than 35 percent.

These soils were correlated as a taxadjunct to the Ceda series because the mollic color of the surface layer extends to a depth of more than 7 inches. Use and management of these soils are so similar to those of Ceda soils that a new series is not needed.

Clarksville Series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable, very cherty soils that formed in residuum of weathered, cherty limestone. The soils are steep and very steep. They are on hillsides. The native vegetation was upland hardwoods and pines. The slope is 20 to 50 percent.

Clarksville soils are near Arkana, Elsah, Moko, Nixa, Noark, and Tonti soils. Arkana soils are in lower positions than Clarksville soils on hillsides; they are 20 to 40 inches deep to bedrock and have a very-fine control section. Elsah soils are on narrow flood plains; they do not have an argillic horizon. Moko soils are in lower positions on hilltops and side slopes; they are less than 20 inches to bedrock and do not have an argillic horizon. Nixa soils are on adjacent higher ridgetops; they have a fragipan. Noark soils are on adjacent similar landscapes; they have a clayey-skeletal control section. Tonti soils are on adjacent higher ridgetops and uplands; they have a fragipan and a fine-loamy control section.

Typical pedon of Clarksville very cherty silt loam, 20 to 50 percent slopes, in a wooded area in the NE1/4NE1/4SW1/4 sec. 28, T. 18 N., R. 25 W.

O1—1 inch to 0; partly decomposed hardwood leaves and twigs.

A—0 to 1 inch; dark grayish brown (10YR 4/2) very cherty silt loam; strong medium granular structure; friable; many roots; 60 percent, by volume, chert fragments; medium acid; abrupt smooth boundary.

E—1 inch to 14 inches; pale brown (10YR 6/3) very cherty silt loam; moderate medium granular structure; friable; many roots; 60 percent, by volume, chert fragments; strongly acid; gradual wavy boundary.

BE—14 to 34 inches; light yellowish brown (10YR 6/4) extremely cherty silt loam; moderate fine subangular blocky structure; friable; common roots; 65 percent, by volume, chert fragments; strongly acid; gradual wavy boundary.

Bt1—34 to 58 inches; brown (7.5YR 5/4) extremely cherty silt loam; moderate fine subangular blocky structure; friable; common roots; thin patchy clay films; 75 percent, by volume, bedded chert fragments; very strongly acid; gradual wavy boundary.

Bt2—58 to 72 inches; yellowish red (5YR 4/6) extremely cherty clay; moderate medium angular blocky structure; firm; thin and medium continuous clay films; 85 percent, by volume, bedded chert fragments; very strongly acid.

The thickness of the solum and the depth to consolidated bedrock are more than 72 inches. The A horizon is medium acid to strongly acid. The rest of the soil is strongly acid or very strongly acid throughout.

The A horizon ranges from 1 inch to 5 inches in thickness. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The content of chert ranges from 50 to 80 percent.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3. The content of chert ranges from 50 to 80 percent.

The BE horizon has hue of 10YR, value of 5 or 6, and chroma of 4.

The Bt1 horizon has hue of 7.5YR or 5YR, value of 5, and chroma of 4 or 6. It is extremely cherty silt loam or extremely cherty silty clay loam. In some pedons it is mottled in shades of brown or pale brown. The Bt2 horizon is extremely cherty silty clay loam, extremely cherty clay, or extremely cherty silty clay. It has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 or 6. It is mottled in shades of brown in places. The content of chert in the B horizon ranges from 60 to 90 percent.

Cleora Series

The Cleora series consists of deep, well drained, moderately rapidly permeable soils that formed in loamy alluvial sediment derived mainly from weathered sandstone, siltstone, and shale. The soils are level to nearly level, and they are on flood plains along the larger streams in the county. They are flooded occasionally for brief periods late in winter or early in spring. The native vegetation was bottomland hardwoods. The slope is 0 to 3 percent.

Cleora soils are near Allen, Ceda, Enders, Healing, Leadvale, and Leesburg soils. Allen soils are on terraces; they have an argillic horizon and a fine-loamy control section. Ceda soils are in lower lying positions immediately adjacent to streams and along smaller tributary streams; they have a loamy-skeletal control section. Enders soils are in higher positions on hillsides; they have an argillic horizon and a clayey control section. Healing soils are on low terraces farther from the stream; they have an argillic horizon and a fine-silty control section. Leadvale soils are on adjacent stream terraces; they have an argillic horizon and a fragipan. Leesburg soils are on terraces, foot slopes, and mountainsides; they have an argillic horizon and a fine-loamy control section.

Typical pedon of Cleora fine sandy loam, occasionally flooded, in a pasture in the NE1/4NW1/4NW1/4 sec. 13, T. 16 N., R. 26 W.

A1—0 to 7 inches; dark brown (10YR 3/3) fine sandy loam; strong medium granular structure; very friable; many roots; medium acid; clear smooth boundary.

A2—7 to 21 inches; dark brown (10YR 3/3) fine sandy loam; weak fine subangular blocky structure; very friable; many fine roots; medium acid; clear wavy boundary.

C1—21 to 30 inches; dark brown (10YR 4/3) fine sandy loam; massive; very friable; common roots; few sandstone pebbles; thin strata of brown (10YR 5/3) sand; medium acid; clear wavy boundary.

C2—30 to 51 inches; dark brown (10YR 4/3) fine sandy loam; massive; very friable; few roots; strata of brown (10YR 5/3) and dark brown (10YR 4/3) loamy sand that are less than 1 inch thick; medium acid; abrupt irregular boundary.

C3—51 to 79 inches; finely stratified dark brown (10YR 4/3) fine sandy loam and brown (10YR 5/3) sand; single grained; loose; few roots; medium acid.

Bedrock is at a depth of 6 to 10 feet or more. The soil is medium acid or slightly acid throughout.

The A horizon is 10 to 24 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sandy loam, loam, or loamy fine sand. It is stratified with finer or coarser textured material.

Elsah Series

The Elsah series consists of deep, well drained to somewhat excessively drained, moderately permeable to moderately rapidly permeable soils. Elsah soils formed in cherty and loamy alluvium washed predominantly from soils that formed in residuum of cherty limestone. Elsah soils are level or nearly level. They are on narrow flood plains, and they are occasionally flooded. The native vegetation was mixed hardwoods. The slope is 0 to 3 percent.

Elsah soils are near Britwater, Clarksville, Noark, Secesh, and Waben soils; unlike Elsah soils, however, all of these soils have an argillic horizon. Britwater soils are on adjacent stream terraces; they have a fine-loamy control section. Clarksville soils are on adjacent steep side slopes. Noark soils are on adjacent side slopes; they have a clayey-skeletal control section. Secesh soils are in positions on the landscape similar to those of Elsah soils; they have a fine-loamy control section. Waben soils are on adjacent alluvial fans and foot slopes.

Typical pedon of Elsah very cherty silt loam, in an area of Elsah very cherty silt loam, occasionally flooded, in a pasture in the SE1/4NE1/4NW1/4 sec. 10, T. 17 N., R. 26 W.

A—0 to 6 inches; dark brown (10YR 3/3) very cherty silt loam; strong medium granular structure; very friable; many roots; 50 percent, by volume, fragments 0.25 inch to 4 inches in diameter; slightly acid; clear smooth boundary.

C1—6 to 11 inches; yellowish brown (10YR 5/4) very cherty silt loam; massive; very friable; 15 percent mixing of soil from above in form of earthworm casts; many roots; 50 percent, by volume, chert fragments 0.25 inch to 3 inches in diameter; medium acid; clear wavy boundary.

C2—11 to 23 inches; yellowish brown (10YR 5/4) very cherty silt loam; massive; friable; common roots; 50 percent, by volume, chert fragments 0.25 inch to 3 inches in diameter; medium acid; clear wavy boundary.

C3—23 to 30 inches; yellowish brown (10YR 5/4) extremely cherty silt loam; massive; many voids; 85 percent, by volume, subrounded chert gravel 0.25 inch to 3 inches in diameter; medium acid; clear irregular boundary.

C4—30 to 50 inches; yellowish brown (10YR 5/4) very cherty silt loam; many coarse pale brown (10YR 6/3) mottles; massive; friable; 60 percent, by volume, chert fragments 0.25 inch to 3 inches in diameter; few thin strata of very cherty loam; medium acid; gradual irregular boundary.

C5—50 to 70 inches; light yellowish brown (10YR 6/4) extremely cherty silt loam; few pale brown and light grayish brown mottles; massive; very friable; 85 percent, by volume, chert fragments 0.25 inch to 8 inches in diameter; some strata of clean gravel; medium acid.

The loamy sediments are 60 to more than 80 inches thick. Reaction is slightly acid or medium acid throughout.

The A horizon, or the Ap horizon in cultivated areas, has hue of 10YR, value of 3 or 4, and chroma of 2, 3, or 4. Where the value is 3, the A horizon is less than 6 inches thick. The content of chert ranges from 35 to 60 percent.

The C horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4, or it has hue of 10YR with value of 4 and chroma of 3 or 4 or value of 5 or 6 and chroma of 4. The texture is the very cherty or extremely cherty analogs of silt loam or loam. Some pedons have thin strata of silt loam or cherty silt loam. The content of chert ranges from 35 to 85 percent in each subhorizon.

Enders Series

The Enders series consists of deep, well drained, very slowly permeable soils that formed in a thin layer of loamy colluvial material and in underlying clayey material that derived from weathered, acid shale. The soils are gently sloping to steep. They are on ridgetops, hillsides, and mountainsides. The native vegetation was upland hardwood forest. The slope is 3 to 40 percent.

Enders soils are near Ceda, Leadvale, Leesburg, Linker, Mountainburg, Nella, and Steprock soils. Ceda soils are on narrow flood plains; they have a loamy-skeletal control section and do not have an argillic horizon. Leadvale soils are on colluvial foot slopes and stream terraces; they are moderately well drained and have a fragipan. Leesburg soils are on mountainsides, benches, and foot slopes; they have a fine-loamy control section and a solum more than 60 inches thick. Linker soils are on hilltops and mountaintops; they have a fine-loamy control section and are 20 to 40 inches deep to sandstone bedrock. Mountainburg soils are on mountaintops and mountainsides; they have a loamy-skeletal control section and are less than 20 inches deep to sandstone bedrock. Nella soils are on benches and mountainsides; they have a fine-loamy control section and a solum more than 60 inches thick. Steprock soils are on mountainsides and mountaintops; they have a loamy-skeletal control section and are 20 to 40 inches deep over sandstone.

Typical pedon of Enders stony loam, 3 to 12 percent slopes, in woodland in the SE1/4NW1/4SW1/4 sec. 19, T. 16 N., R. 25 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) stony loam; moderate medium granular structure; very friable; 20 percent, by volume, sandstone fragments 0.25 inch to 14 inches in diameter; strongly acid; abrupt smooth boundary.

A2—3 to 6 inches; dark brown (10YR 4/3) stony loam; moderate medium granular structure; very friable; 20 percent, by volume, sandstone fragments; 0.25 inch to 14 inches in diameter; strongly acid; clear wavy boundary.

BE—6 to 10 inches; strong brown (7.5YR 5/6) gravelly loam; moderate fine subangular blocky structure; friable; 15 percent, by volume, sandstone gravel; strongly acid; abrupt wavy boundary.

Bt1—10 to 26 inches; red (2.5YR 4/6) clay; strong fine angular blocky structure; firm; plastic; thick continuous clay films; very strongly acid; gradual wavy boundary.

Bt2—26 to 52 inches; mottled red (2.5YR 4/6) and light gray (10YR 6/1) clay; moderate fine angular blocky structure; firm; very plastic; thick continuous clay films; 5 percent, by volume, sandstone gravel; common weathered shale fragments; extremely acid; gradual wavy boundary.

Bt3—52 to 58 inches; mottled yellowish brown (10YR 5/4) and light gray (10YR 6/1) shaly silty clay; weak coarse subangular blocky structure; firm; thin continuous clay films; 20 percent, by volume, shale fragments; extremely acid; gradual wavy boundary.

Cr—58 to 84 inches; soft, weathered shale; about 3 percent silty clay soil material between shale plates.

The thickness of the solum and the depth to shale bedrock range from 40 to 60 inches. The soil is strongly acid to extremely acid throughout.

The A horizon is 1 inch to 6 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly loam or stony loam. The content of coarse fragments ranges from 15 to 35 percent by volume. In cultivated areas, the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3.

In some pedons there is an E horizon. It is 2 to 7 inches thick. It has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The content of coarse fragments ranges from 5 to 25 percent by volume.

The BE horizon has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is gravelly loam, stony loam, gravelly clay loam, or stony clay loam.

The Bt1 horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. The Bt2 horizon has the same color and texture as the Bt1 horizon but commonly is mottled in shades of red, brown, and gray. The Bt1 and Bt2 horizons are silty clay or clay. Gravel or stones make up 0 to 15 percent of the Bt1 and Bt2 horizons.

The Bt3 horizon is mottled in shades of brown, red, and gray. It is silty clay or clay. The content of shale ranges from 15 to 50 percent.

The Cr horizon is acid, brown to black, weathered shale grading to unweathered shale bedrock.

Healing Series

The Healing series consists of deep, well drained, moderately permeable soils that formed in silty sediments. The soils are nearly level. They are on low terraces along larger streams. The native vegetation was bottomland hardwoods. The slope is 1 to 3 percent. Flooding can occur on these soils under abnormal conditions.

Healing soils are near Allen, Ceda, Cleora, Johnsburg, and Leadvale soils. Allen soils are on higher lying stream terraces; they do not have a mollic epipedon. Ceda soils are on lower lying flood plains along intersecting smaller streams; they have a loamy-skeletal control section and do not have an argillic horizon. Cleora soils are on adjacent, lower lying flood plains; they have a coarse-loamy control section and do not have an argillic horizon. Johnsburg soils are in slight depressions on stream terraces and uplands. Johnsburg soils are somewhat poorly drained; they have a fragipan and do not have a mollic epipedon. Leadvale soils are on higher lying stream terraces; they have a fragipan and do not have a mollic epipedon.

Typical pedon of Healing silt loam, 1 to 3 percent slopes, in a pasture in the SW1/4SW1/4SE1/4 sec. 12, T. 16 N., R. 26 W.

A1—0 to 10 inches; dark brown (10YR 3/3) silt loam; moderate medium granular and weak fine subangular blocky structure; friable; many fine roots; few sandstone pebbles; strongly acid; gradual smooth boundary.

Bt1—10 to 33 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common patchy clay films; common fine roots; few fine sandstone pebbles; medium acid; gradual wavy boundary.

Bt2—33 to 57 inches; reddish brown (5YR 4/4) silty clay loam; common medium brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; many thin clay films; few fine roots; medium acid; gradual wavy boundary.

Bt3—57 to 70 inches; reddish brown (5YR 4/4) silty clay loam; many coarse brown (7.5YR 5/4) mottles; moderate medium angular and subangular blocky structure; firm; common thin and medium clay films; many dark soft masses; few roots; strongly acid; gradual wavy boundary.

Bt4—70 to 85 inches; mottled reddish brown (5YR 4/4) and yellowish brown (10YR 5/4) loam; moderate coarse subangular blocky structure; friable; thin patchy clay films; few sandstone pebbles; many dark soft masses; very strongly acid; clear wavy boundary.

C—85 to 95 inches; brown (10YR 5/4) extremely gravelly sandy loam; weak medium coarse granular; very friable; 80 percent, by volume, sandstone fragments 0.25 inch to 8 inches in diameter; strongly acid.

The solum is 60 to more than 72 inches thick. The A horizon and the upper part of the Bt horizon are medium acid to strongly acid, and the lower part of the Bt horizon and the C horizon are medium acid to very strongly acid.

The A horizon is 10 to 20 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3, or it has hue of 7.5YR, value of 3, and chroma of 2. The content of gravel ranges from 0 to 5 percent by volume.

The Bt1 horizon has hue of 10YR, value of 4, and chroma of 3 or 4, or it has hue of 7.5YR or 5YR, value of 4, and chroma of 4. It is silt loam or silty clay loam. The content of gravel ranges from 0 to 5 percent by volume. The Bt2 and Bt3 horizons have hue of 10YR, value of 4, and chroma of 3 or 4, or they have hue of 7.5YR or 5YR, value of 4, and chroma of 4. In some pedons they are mottled in shades of brown. The Bt2 and Bt3 horizons are silt loam or silty clay loam, and the Bt4 horizon is loam, silt loam, clay loam, gravelly loam, or gravelly clay loam. Gravel makes up 0 to 5 percent, by volume, of the Bt2 and Bt3 horizons and 0 to 25 percent, by volume, of the Bt4 horizon.

The C horizon is sandy loam, loamy sand, gravelly sandy loam, very gravelly sandy loam, or extremely gravelly sandy loam. It is at a depth of more than 60 inches.

The Healing soil in this survey area was correlated as a taxadjunct to the Healing series because pH values are about one-half pH unit lower throughout the solum than is allowed in the range for the series. This difference does not affect the use and management of the soil.

Johnsburg Series

The Johnsburg series consists of deep, somewhat poorly drained, very slowly permeable soils that formed in silty old alluvium or in residuum of weathered sandstone, siltstone, and shale. The soils are level. They are in slight depressions on stream terraces and broad uplands. The native vegetation was mixed hardwood. The slope is 0 to 1 percent.

Johnsburg soils are near Captina, Cleora, Healing, Leadvale, and Tonti soils. Captina soils are on adjacent broad uplands; they are moderately well drained and do not have gray mottles in the upper part of the Bt horizon. Cleora soils are on lower adjacent flood plains; they do not have an argillic horizon, and they have more sand throughout than Johnsburg soils. Healing soils are on low terraces; they are well drained, have a mollic epipedon, and do not have a fragipan. Leadvale soils are on adjacent stream terraces; they are moderately well drained and do not have gray mottles in the upper part of the Bt horizon. Tonti soils are on adjacent higher landscapes; they are moderately well drained and have a fine-loamy control section.

Typical pedon of Johnsburg silt loam, 1 to 3 percent slopes, in the NW1/4SE1/4SE1/4 sec. 4, T. 17 N., R. 27 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; common medium faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

Bt—7 to 22 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct pale brown (10YR 6/3) and few medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable; few thin clay films; strongly acid; gradual wavy boundary.

Btx—22 to 34 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) silty clay loam; weak coarse prismatic structure parting to moderate fine subangular blocky; firm; brittle; common thin clay films; common small concretions; strongly acid; gradual wavy boundary.

B't—34 to 72 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light gray (10YR 7/2) and common medium prominent yellowish red (5YR 4/8) mottles; weak fine subangular blocky structure; firm, plastic; common thin clay films; strongly acid.

The thickness of the solum and the depth to bedrock range from 60 to more than 80 inches. Reaction ranges from strongly acid to slightly acid in the Ap horizon and strongly acid to extremely acid below the Ap horizon.

The Ap horizon is 5 to 10 inches thick. It has hue of 10YR, value of 4, or 5, and chroma of 2 or 3. In some pedons there is a BE horizon that is silt loam and is 4 to

7 inches thick. It has hue of 10YR, value of 5, and chroma of 4 or 6 and has mottles in shades of brown and gray.

The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6, and it is mottled in shades of brown and gray. It is silt loam or silty clay loam.

The depth to the Btx horizon is 18 to 32 inches. The Btx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2, 3, 4, or 6, and it is mottled in shades of gray and brown. It is silt loam or silty clay loam.

The B't horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2, 3, 4, or 6, or it has hue of 5YR, value of 4 or 5 and chroma of 6 or 8, and it is mottled. The B't horizon is silty clay loam or silty clay. Coarse fragments make up 0 to 10 percent of the B't horizon.

Leadvale Series

The Leadvale series consists of deep, moderately well drained, slowly permeable, gently sloping soils that formed in loamy colluvial deposits or in old alluvium that washed from sandstone and shale. The soils are on stream terraces and on colluvial foot slopes. The native vegetation was mixed hardwood forest. The slope is 3 to 8 percent.

Leadvale soils are near Allen, Cleora, Enders, Healing, Leesburg, and Nella soils; unlike Leadvale soils, all of these nearby soils do not have a fragipan. Allen, Leesburg, and Nella soils are in positions on the landscape similar to those of Leadvale soils. They are well drained. Cleora soils are on flood plains. They do not have an argillic horizon. Enders soils are on side slopes and hillsides. They have a clayey control section. Healing soils are on low terraces. They have a mollic epipedon, which Leadvale soils do not have.

Typical pedon of Leadvale loam, 3 to 8 percent slopes, in a pasture in the NE1/4SE1/4SE1/4 sec. 23, T. 16 N., R. 26 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam; strong medium granular structure; very friable; many fine roots; few sandstone pebbles; some mixing of Bt material; medium acid; abrupt smooth boundary.

Bt—8 to 19 inches; yellowish brown (10YR 5/6) loam; moderate fine subangular blocky structure; friable; common roots; thin patchy clay films; few medium irregular concretionary masses; strongly acid; clear wavy boundary.

Btx1—19 to 28 inches; yellowish brown (10YR 5/6) loam; many coarse pale brown (10YR 6/3) and light gray (10YR 7/2) mottles; moderate medium and coarse subangular blocky structure; firm, brittle; thin patchy clay films; common coarse concretionary masses; very strongly acid; clear wavy boundary.

Btx2—28 to 47 inches; strong brown (7.5YR 5/8) loam; many coarse light gray (10YR 7/2) and common medium pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; very firm, brittle; thin patchy clay films; many coarse concretionary masses; very strongly acid; gradual wavy boundary.

B't1—47 to 62 inches; mottled light gray (10YR 7/2) and strong brown (7.5YR 5/8) clay loam; moderate medium subangular and angular blocky structure; firm; thin patchy clay films; few medium concretions; very strongly acid; gradual irregular boundary.

B't2—62 to 78 inches; light gray (10YR 7/2) clay; many coarse yellowish brown (10YR 5/8) and few medium prominent yellowish red (5YR 4/8) mottles; moderate medium subangular and angular blocky structure; firm; thin and medium patchy clay films; very strongly acid.

The thickness of the solum and the depth to bedrock range from 60 to 90 inches or more. The depth to the fragipan ranges from 17 to 26 inches. Except where it has been limed, the soil is strongly acid or very strongly acid throughout.

The A horizon is 5 to 10 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3. The content of sandstone gravel ranges from 0 to 10 percent.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is loam, clay loam, or silty clay loam. The content of sandstone gravel ranges from 0 to 15 percent.

The Btx horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4, 6, or 8; or it has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. It is variously mottled in shades of brown, gray, or red. It is clay loam, loam, or silty clay loam.

The B't1 and B't2 horizons are variously mottled in shades of gray, brown, and red. The texture is clay loam, silty clay, or clay or the gravelly analogs. Gravel content is 0 to 25 percent.

Leadvale soils in Madison County are considered taxadjuncts to the Leadvale series because they are in a fine-loamy family rather than a fine-silty family. Typically, in this survey area, the Bt horizon is loam or clay loam, the BX horizon is loam or clay loam, and the B't horizon is clay loam. Behavior, use, and management of the soils are so similar to those of Leadvale soils that a new series is not needed.

Leesburg Series

The Leesburg series consists of deep, well drained, moderately permeable, gently sloping to steep soils that formed in loamy colluvium from weathered, sandstone and shale. The soils are in colluvial positions on side slopes of hills and mountains and on benches and terraces. Leesburg soils most commonly are intermingled with Enders soils in a complex pattern. The native vegetation was mixed upland hardwoods. The slope is 3 to 40 percent.

Leesburg soils are near Enders, Leadvale, Mountainburg, Nella, and Steprock soils. Enders soils are on mountainsides, hillsides, and ridges. They have a clayey control section and a solum less than 60 inches thick. Leadvale soils are on stream terraces or colluvial foot slopes. They have a fragipan. Mountainburg soils are on ridgetops and mountainsides. They have a loamy-skeletal control section and are less than 20 inches deep to bedrock. Nella soils are in positions on the landscape similar to those of Leesburg soils. They have a yellowish red argillic horizon. Steprock soils are on ridgetops and side slopes. They have soft bedrock within a depth of 40 inches and have a loamy-skeletal control section.

Typical pedon of Leesburg stony loam, in an area of Enders-Leesburg stony loams, 20 to 40 percent slopes, in the NW1/4NE1/4SW1/4 sec. 35, T. 15 N., R. 26 W.

A—0 to 3 inches; dark brown (10YR 3/3) stony loam; strong medium granular structure; very friable; many fine and medium roots; 15 percent, by volume, sandstone fragments 10 to 24 inches in diameter, 15 percent gravel and cobbles 0.5 inch to 10 inches in diameter; medium acid; clear wavy boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) stony loam; weak fine subangular blocky structure; very friable; many fine and common medium roots; 15 percent, by volume, sandstone fragments 10 to 14 inches in diameter, 15 percent sandstone gravel and cobbles 0.5 inch to 10 inches in diameter; strongly acid; clear wavy boundary.

BE—7 to 11 inches; yellowish brown (10YR 5/6) gravelly loam; moderate fine subangular blocky structure; friable; many fine roots; 25 percent, by volume, sandstone gravel; strongly acid; clear wavy boundary.

Bt1—11 to 23 inches; strong brown (7.5YR 5/6) gravelly clay loam; moderate fine subangular blocky structure; common fine and few medium roots; 20 percent, by volume, sandstone gravel, 7 percent cobbles; thin patchy clay films on ped faces; strongly acid; clear wavy boundary.

Bt2—23 to 38 inches; mottled strong brown (7.5YR 5/6), yellowish red (5YR 4/6), and pale brown (10YR 6/3) gravelly clay loam; moderate medium subangular and angular blocky structure; firm; common fine roots; 20 percent, by volume, gravel, 10 percent cobbles; thin patchy clay films; strongly acid; gradual wavy boundary.

2Bt3—38 to 62 inches; mottled strong brown (7.5YR 5/6), yellowish red (5YR 5/6), and light brownish gray (10YR 6/2) very gravelly silty clay; moderate fine angular blocky structure; firm; few fine roots; 30 percent, by volume, sandstone gravel, 10 percent cobbles; thin continuous clay films; very strongly acid; gradual irregular boundary.

2Bt4—62 to 72 inches; mottled yellowish brown (10YR 5/6), yellowish red (5YR 4/6), and light gray (10YR 7/2) gravelly clay; moderate fine angular blocky structure; firm; 25 percent, by volume, sandstone gravel, 5 percent cobbles 3 to 6 inches in diameter; thin and medium continuous clay films; very strongly acid.

The solum is 60 to more than 80 inches thick. The depth to shale or sandstone bedrock is more than 72 inches. The A horizon is medium acid or strongly acid, and the rest of the soil is strongly acid or very strongly acid throughout.

The A horizon is 1 inch to 6 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly loam or stony loam. In some pedons there is an Ap horizon. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly loam or stony loam. Coarse fragments of sandstone make up 10 to 30 percent of the A and E horizons.

The E horizon is 3 to 8 inches thick. It has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is gravelly loam or stony loam.

The BE horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 4, or it has value of 5 and chroma of 4 or 6. It is loam, gravelly loam, or stony loam. It is 3 to 10 inches thick.

The Bt1 and Bt2 horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. The Bt2 horizon commonly is mottled in shades of red or brown. The texture is gravelly loam or gravelly clay loam. Coarse fragments make up about 15 to 30 percent of the Bt1 and Bt2 horizons.

The 2Bt3 and 2Bt4 horizons are mottled in shades of brown, gray, and red. The texture is silty clay or clay or the shaly, gravelly, or very gravelly analogs. Coarse fragments, which are mainly gravel-sized, of sandstone or shale make up 0 to 40 percent of the 2Bt3 and 2Bt4 horizons.

Linker Series

The Linker series consists of moderately deep, well drained, moderately permeable, gently sloping soils that formed in residuum of weathered, acid sandstone bedrock. These soils are on mountaintops and ridgetops. The native vegetation was mixed upland hardwoods. The slope is 3 to 8 percent.

Linker soils are near Enders, Mountainburg, and Steprock soils. Enders soils are on adjacent ridgetops and side slopes; they have a clayey control section and are more than 40 inches deep to shale bedrock. Mountainburg soils are on adjacent hilltops and mountaintops; they are less than 20 inches deep to bedrock and have a loamy-skeletal control section. Steprock soils are on adjacent similar slopes and on the steeper part of side slopes; they have a loamy-skeletal control section.

Typical pedon of Linker loam, 3 to 8 percent slopes, in a pasture in the NE1/4SE1/4SW1/4 sec. 11, T. 16 N., R. 26 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam; moderate medium granular structure; friable; many fine roots; 5 percent, by volume, sandstone gravel; medium acid; abrupt smooth boundary.

BE—7 to 12 inches; strong brown (7.5YR 5/6) loam; moderate fine subangular blocky structure; friable; common fine roots; 3 percent, by volume, sandstone gravel; strongly acid; clear wavy boundary.

Bt—12 to 33 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy clay films on ped faces and in pores; 3 percent, by volume, sandstone gravel; strongly acid; abrupt wavy boundary.

BC—33 to 38 inches; yellowish red (5YR 4/6) gravelly loam; many coarse prominent pale brown (10YR 6/3) mottles; weak fine subangular blocky structure; friable; few fine roots; 25 percent, by volume, sandstone gravel; very strongly acid; abrupt wavy boundary.

R—38 to 40 inches; hard, level-bedded, acid sandstone; few vertical cracks more than 4 inches apart.

The solum is 20 to 40 inches thick. The depth to bedrock also ranges from 20 to 40 inches. Reaction ranges from extremely acid to strongly acid throughout, except where the surface layer has been limed.

The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3, or it has value of 4 and chroma of 2 or 4. The content of sandstone gravel ranges from 0 to 15 percent.

The BE horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is loam or sandy clay loam.

The Bt horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. It is sandy clay loam, clay loam, or loam. The lower part is mottled in shades of brown and red in some pedons. Sandstone fragments make up 0 to 10 percent of the BE and Bt horizons.

The BC horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. It has mottles in shades of red, brown, and gray. It is gravelly loam or gravelly fine sandy loam. The content of sandstone fragments ranges from 15 to 25 percent.

Mayes Series

The Mayes series consists of deep, somewhat poorly drained, very slowly permeable soils that formed in silty and clayey sediments in broad valley fills and on stream terraces. The native vegetation was scattered hardwood trees and an understory of tall grasses. The soils are level and are in slight depressions. The slope is 0 to 1 percent.

Mayes soils are near Leadvale and Johnsburg soils. Leadvale soils are on adjacent sloping landscapes, are moderately well drained and have a fragipan. Johnsburg soils are on similar adjacent landscapes, and they have a fragipan and a fine-silty control section.

Typical pedon of Mayes silty clay loam, in a pasture in the NE1/4NE1/4SW1/4 sec. 16, T. 17 N., R. 27 W.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate fine and medium subangular blocky structure; friable; many fine roots; slightly acid; clear smooth boundary.

Btg1—10 to 24 inches; very dark gray (10YR 3/1) silty clay loam; common medium olive brown (2.5Y 4/4) mottles; moderate fine and medium angular blocky structure; very firm; thin patchy clay films; common fine roots; few chert fragments 0.25 to 0.5 inch in diameter; common fine dark concretions; medium acid; gradual smooth boundary.

Btg2—24 to 34 inches; very dark gray (10YR 3/1) silty clay; many coarse olive brown (2.5YR 4/4) mottles; moderate medium angular blocky structure; very firm; continuous medium clay films; common fine roots; few chert fragments 0.25 to 0.5 inch in diameter; many fine dark concretions; slightly acid; clear irregular boundary.

Btg3—34 to 41 inches; variegated very dark gray (10YR 3/1) and olive brown (2.5Y 4/4) silty clay; moderate medium and coarse angular blocky structure; very firm; continuous thick clay films on faces of peds; few roots; few chert fragments 0.25 to 0.5 inch in diameter; many fine dark concretions; slightly acid; clear irregular boundary.

Btg4—41 to 58 inches; dark gray (10YR 4/1) clay; many coarse olive brown (2.5Y 4/4) mottles; weak coarse columnar structure breaking to moderate medium and coarse angular blocky; very firm; continuous thick clay films on faces of peds; many very dark gray (10YR 3/1) krotovinas; 2 percent, by volume, fine chert; common secondary lime concretions; vertical cracks extend through horizon; neutral; gradual irregular boundary.

Btg5—58 to 72 inches; dark gray (10YR 4/1) clay; many coarse prominent light olive brown (2.5Y 5/4) mottles; moderate coarse prismatic structure breaking to moderate coarse angular; very firm; continuous thick clay films on faces of peds; common non-intersecting gray (10YR 5/1) slickensides; common secondary lime or gypsum concretions; neutral.

The solum is 60 to more than 90 inches thick. The A horizon is slightly acid or medium acid, and the B horizon is medium acid to mildly alkaline.

The A horizon ranges from 8 to 18 inches in thickness. The Ap and A1 horizons have hue of 10YR, value of 2 or 3, and chroma of 1 or 2.

The Btg1, Btg2, and Btg3 horizons have hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. They have mottles in shades of brown and gray. The Btg1 and Btg2 horizons are silty clay loam, silty clay, or clay, and the Btg3 horizon is clay or silty clay. The Btg4 and Btg5 horizons have hue of 10YR, value of 4 or 5, and chroma of 1. They are mottled in shades of brown, red, or gray. They are clay or silty clay.

Moko Series

The Moko series consists of shallow, well drained, moderately permeable soils that formed in residuum of limestone. The soils are moderately sloping to steep and are on hillsides. The native vegetation was an open stand of redcedar and hardwood trees and a cover of native grasses in the openings. The slope is 8 to 40 percent.

Moko soils are near Arkana and Clarksville soils. Arkana soils are on adjacent similar landscapes. They are 20 to 40 inches deep to bedrock and have an argillic horizon. Clarksville soils are in higher positions on hillsides than Moko soils. They are more than 60 inches deep to bedrock and have an argillic horizon.

Typical pedon of Moko very stony silt loam, in an area of Arkana-Moko complex, 20 to 40 percent slopes, in the NW1/4NE1/4NW1/4 sec. 20, T. 19 N., R. 25 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) very stony silt loam; strong medium granular structure; friable; many fine and medium roots; 15 percent, by volume, chert 1 inch to 4 inches in diameter, 45 percent limestone fragments 3 to 24 inches in diameter; neutral; clear wavy boundary.

A2—5 to 10 inches; dark brown (10YR 3/3) very stony silt loam; moderate medium granular structure; friable; many fine and medium roots; 15 percent chert 1 inch to 4 inches in diameter, 50 percent limestone fragments 3 to 20 inches in diameter; neutral; abrupt irregular boundary.

R—10 to 12 inches; limestone bedrock; few cracks and fractures filled with silt loam soil material.

The thickness of the solum and the depth to bedrock range from 6 to 20 inches. The soil is neutral or mildly alkaline throughout. Coarse fragments make up 35 to 85 percent of the volume. The content of chert fragments ranges from 0 to 25 percent, and the content of limestone fragments more than 3 inches in diameter ranges from 25 to 60 percent.

The A horizon ranges from 6 to 20 inches in thickness. It has hue of 10YR, value of 2 or 3, and chroma of 1, 2, or 3.

The R horizon is level-bedded limestone or dolomite. In most places it is fractured and has few to common vertical cracks as much as several inches wide. The cracks are filled with material of the A horizon.

Mountainburg Series

The Mountainburg series consists of shallow, well drained, moderately rapidly permeable, gently sloping to very steep soils on the tops and sides of ridges, hills, and mountains. The soils formed in residuum of acid sandstone bedrock. The native vegetation was mixed hardwood forest, scattered stands of pines, and an understory of tall grasses in small clearings on south-facing slopes. The slope is 3 to 60 percent.

Mountainburg soils are near Enders, Leesburg, Linker, Nella, and Steprock soils, all of which are deeper over bedrock than Mountainburg soils. Enders soils are on side slopes and ridgetops; they have a clayey control section. Leesburg soils are on hillsides, mountainsides, foot slopes, and benches; they have a fine-loamy control section. Linker soils are on hilltops and mountaintops; they have a fine-loamy control section. Nella soils are on hillsides and mountainsides and are commonly intermingled in a complex pattern with Steprock and Mountainburg soils; Nella soils have a fine-loamy control section. Steprock soils are in positions on the landscape similar to those of Mountainburg soils. Steprock soils, however, are 20 to 40 inches deep over sandstone bedrock.

Typical pedon of Mountainburg stony loam, 3 to 20 percent slopes, in a pasture in the SE1/4SW1/4SE1/4 sec. 11, T. 16 N., R. 24 W.

A—0 to 1 inch; dark brown (10YR 3/3) stony loam; weak medium granular structure; very friable; many fine and medium roots; many fine pores; 30 percent, by volume, sandstone fragments 1 inch to 24 inches in diameter; medium acid; clear smooth boundary.

E—1 inch to 5 inches; brown (10YR 4/3) stony loam; weak medium granular structure; very friable; many fine and medium roots; many fine pores; 25 percent, by volume, sandstone fragments 1 inch to 24 inches in diameter; strongly acid; gradual smooth boundary.

Bt—5 to 18 inches; yellowish brown (10YR 5/6) very gravelly loam; moderate medium subangular blocky structure; friable; few thin patchy clay films on faces of peds; about 5 percent, by volume, stones and 35 percent, by volume, sandstone gravel; strongly acid; abrupt smooth boundary.

R—18 to 20 inches; hard, level-bedded, thin-layered sandstone.

The thickness of the solum and the depth to sandstone bedrock range from 12 to 20 inches. The A horizon is medium acid to very strongly acid, and the Bt horizon is strongly acid or very strongly acid.

The A horizon is 1 to 5 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly loam, stony loam, very stony sandy loam, or very stony loam. The content of coarse fragments ranges from 15 to 60 percent.

In areas that have been cultivated the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3, or it has value of 4 and chroma of 2. It is 4 to 8 inches thick.

The E horizon is 3 to 8 inches thick. It has hue of 10YR, value of 5, and chroma of 3 or 4, or it has value of 4 and chroma of 3. It is gravelly loam, stony loam, or very stony loam. The content of coarse fragments ranges from 15 to 60 percent.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. It is loam or sandy clay loam and the very gravelly or very stony analogs. Coarse fragments make up 35 to 60 percent of the horizon.

The R horizon is horizontally bedded, thin-layered to thick-layered, acid sandstone.

Nella Series

The Nella series consists of deep, well drained, moderately permeable, gently sloping to very steep soils on hillsides, mountainsides, foot slopes, and benches. The soils formed in loamy colluvium derived from acid sandstone and minor amounts of shale and siltstone. The native vegetation was hardwood forest. The slope is 3 to 60 percent.

Nella soils are near Enders, Leadvale, Leesburg, Linker, Mountainburg, and Steprock soils. Enders soils are on hillsides and ridgetops; they have a clayey control section and a solum that is less than 60 inches thick. Leadvale soils commonly are in lower positions on the landscape than Nella soils; they are moderately well drained and have a fragipan. Leesburg soils are in colluvial positions on the landscape similar to those of Nella soils; they have a yellowish brown or strong brown argillic horizon. Linker soils are on hilltops and mountainsides; they are 20 to 40 inches deep over sandstone bedrock. Mountainburg soils are on the top and sides of hills, mountains, and ridges; they have a loamy-skeletal control section and are less than 20 inches deep over sandstone bedrock. Steprock soils are on ridgetops, mountaintops, and mountainsides. Where they are steep and very steep, they are intermingled in a complex pattern with Nella and Mountainburg soils. Steprock soils have a loamy-skeletal control section and are 20 to 40 inches deep over sandstone bedrock.

Typical pedon of Nella very stony loam, in an area of Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes, in the SW1/4NW1/4SW1/4 sec. 2, T. 13 N., R. 28 W.

A—0 to 1 inch; dark brown (10YR 3/3) very stony loam; strong medium granular structure; very friable; many fine and medium tree roots; 40 percent, by volume, sandstone fragments as much as 28 inches in diameter; very strongly acid; abrupt smooth boundary.

E—1 inch to 4 inches; dark brown (10YR 4/3) cobbly loam; moderate medium granular structure; very friable; many fine and medium tree roots; 30 percent, by volume, sandstone fragments 0.5 inch to 14 inches in diameter; very strongly acid; clear wavy boundary.

BE—4 to 12 inches; yellowish red (5YR 4/6) cobbly loam; weak fine subangular blocky structure; friable; common fine and medium tree roots; 15 percent, by volume, sandstone fragments 0.5 inch to 10 inches in diameter; very strongly acid; clear wavy boundary.

Bt1—12 to 36 inches; yellowish red (5YR 4/6) cobbly clay loam; moderate fine subangular blocky structure; firm; few thin patchy clay films on faces of peds; 25 percent, by volume, sandstone fragments 0.5 inch to 10 inches in diameter; very strongly acid; gradual wavy boundary.

Bt2—36 to 72 inches; red (2.5YR 4/6) cobbly clay loam; moderate medium subangular blocky structure; firm; common thin and medium patchy clay films on faces of peds; 25 percent, by volume, sandstone fragments 0.5 inch to 10 inches in diameter; very strongly acid.

The solum is 6 to 8 feet or more thick. Reaction is very strongly acid or strongly acid throughout.

The A horizon is 1 inch to 5 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The content of sandstone fragments in the A horizon ranges from 15 to 50 percent.

In cultivated areas the Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly loam, stony loam, or very stony loam.

The E horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It is gravelly loam, cobbly loam, stony loam, or very stony loam. In some pedons there is no E horizon.

The BE horizon has hue of 5YR, value of 4, and chroma of 4, 6, or 8, or it has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is loam, gravelly loam, or cobbly loam. The content of sandstone fragments ranges from 10 to 35 percent.

The Bt horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 6 or 8. In some pedons, the middle and lower parts are mottled in shades of red, brown, and gray. The texture is loam or clay loam and the gravelly, cobbly, or stony analogs. The content of sandstone fragments ranges from 15 to 35 percent.

Nixa Series

The Nixa series consists of deep, moderately well drained, very slowly permeable, very cherty soils that formed in residuum of weathered, cherty limestone. The soils are gently sloping to moderately steep. They are on ridgetops and on the border of broad uplands. The native vegetation was upland hardwoods. The slope is 3 to 15 percent.

Nixa soils are near Captina, Clarksville, Noark, and Tonti soils. Captina soils are on adjacent broad upland flats. They do not contain chert in the A horizon and have a fine-silty control section. Clarksville soils are in adjacent lower-lying positions on side slopes. They do not have a fragipan. Noark soils are on similar landscapes and in lower positions on hillsides. They do not have a fragipan, and they have a clayey-skeletal control section. Tonti soils are on adjacent broader ridges and broad uplands. They contain less chert above the fragipan than Nixa soils, have an argillic horizon above the fragipan, and have a fine-loamy control section.

Typical pedon of Nixa very cherty silt loam, 3 to 8 percent slopes, in a wooded area in the NW1/4NW1/4SE1/4 sec. 3, T. 17 N., R. 26 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very cherty silt loam; strong medium granular structure; very friable; many fine and medium roots; 50 percent, by volume, chert fragments 0.25 inch to 4 inches in diameter; strongly acid; clear smooth boundary.

E—3 to 7 inches; brown (10YR 5/3) very cherty silt loam; moderate medium granular structure; friable; many fine and medium roots; 50 percent, by volume, chert 0.25 inch to 4 inches in diameter; strongly acid; clear smooth boundary.

BE—7 to 18 inches; light yellowish brown (10YR 6/4) very cherty silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; 50 percent, by volume, chert fragments 0.25 inch to 4 inches in diameter; strongly acid; clear wavy boundary.

Btx—18 to 31 inches; yellowish brown (10YR 5/4) extremely cherty silt loam; many coarse distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm, brittle; few roots; thin patchy clay films on ped faces; 65 percent, by volume, chert fragments 0.25 inch to 5 inches in diameter; very strongly acid; clear wavy boundary.

Bt—31 to 72 inches; red (2.5YR 4/6) extremely cherty clay; common coarse prominent brown (10YR 5/3) mottles; moderate medium angular blocky structure; firm; thin continuous clay films; 75 percent, by volume, rippable bedded chert fragments 3 to 8 inches in diameter; very strongly acid.

The thickness of the solum and the depth to consolidated bedrock are more than 72 inches. The depth to the fragipan is 15 to 22 inches. The soil is strongly acid or very strongly acid throughout.

The A horizon ranges from 1 inch to 5 inches in thickness. It has hue of 10YR, value of 3 or 4, and chroma of 2. In cultivated areas the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3. The content of chert in the A and E horizons ranges from 35 to 70 percent.

The BE horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6. It is very cherty silt loam or extremely cherty silt loam. The content of chert ranges from 35 to 75 percent.

The Btx horizon has hue of 10YR, value of 5, and chroma of 4 or 6, or it has hue of 7.5YR, value of 5, and chroma of 4 or 6. It is mottled in shades of brown, gray, or red. It is very cherty silt loam, very cherty silty clay loam, extremely cherty silt loam, or extremely cherty silty clay loam. The content of chert ranges from 40 to 75 percent.

The Bt horizon has hue of 2.5YR and value of 3 and chroma of 6 or value of 4 and chroma of 4, 6, or 8; or it has hue of 5YR, value of 4, and chroma of 4 or 6. It is mottled in shades of red, brown, and gray. It is very cherty silty clay, very cherty clay, extremely cherty silty clay, or extremely cherty clay. The content of chert ranges from 50 to 85 percent.

Noark Series

The Noark series consists of deep, well drained, moderately permeable soils that formed in residuum of cherty limestone. The soils are moderately sloping to very steep. They are on hillsides and narrow ridgetops. The native vegetation was mixed hardwoods and pine. The slope is 8 to 45 percent.

Noark soils are near Captina, Clarksville, Elsah, Nixa, and Tonti soils. Captina soils are on adjacent broad upland flats. They have a fragipan and a fine-silty control section. Clarksville soils are on adjacent similar landscapes. They have a loamy-skeletal control section. Elsah soils are on adjacent narrow flood plains. Unlike Noark soils, they do not have an argillic horizon, and they have a loamy-skeletal control section. Nixa soils are on narrow ridgetops. They have a fragipan. Tonti soils are on adjacent upland landscapes. They have a fragipan and a fine-loamy control section.

Typical pedon of Noark very cherty silt loam, 12 to 20 percent slopes, in a pasture in the NW1/4NE1/4SW1/4 sec. 1, T. 17 N., R. 26 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) very cherty silt loam; weak fine granular structure; friable; many fine and medium roots; few fine pores; about 40 percent, by volume, chert fragments about 0.5 inch to 3 inches in diameter; slightly acid; clear smooth boundary.

E—6 to 11 inches; brown (10YR 5/3) very cherty silt loam; weak fine granular structure; friable; many fine and medium roots; few fine pores; about 40 percent, by volume, chert fragments about 0.5 inch to 3 inches in diameter; strongly acid; clear smooth boundary.

BE—11 to 17 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak medium subangular blocky structure; firm; few fine and medium roots; few fine pores; about 35 percent, by volume, chert fragments about 0.5 inch to 4 inches in diameter; strongly acid; clear smooth boundary.

Bt1—17 to 27 inches; yellowish red (5YR 4/6) very cherty clay; moderate medium subangular blocky structure; firm; few medium roots; few fine pores; thin patchy clay films on faces of peds; about 35 percent, by volume, chert fragments about 0.5 inch to 4 inches in diameter; strongly acid; clear smooth boundary.

Bt2—27 to 47 inches; yellowish red (5YR 4/6) extremely cherty clay; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few medium roots; few fine pores; thin continuous clay films on faces of peds; about 70 percent, by volume, chert fragments about 1 inch to 6 inches in diameter; strongly acid; gradual wavy boundary.

Bt3—47 to 72 inches; dark red (2.5YR 3/6) extremely cherty clay; moderate medium subangular blocky structure; firm; few fine pores; medium continuous clay films on faces of peds; about 70 percent, by volume, chert fragments 1 inch to 6 inches in diameter; strongly acid.

The thickness of the solum and the depth to consolidated bedrock are more than 72 inches. The A and Ap horizons range from strongly acid to slightly acid, and the E, BE, and Bt horizons are very strongly acid or strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. In unplowed areas the A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3. The content of chert in the A and E horizons ranges from 35 to 75 percent.

The BE horizon has hue of 5YR, value of 4, and chroma of 6, or it has hue of 7.5YR or 10YR, value of 5, and chroma of 4 or 6. The texture is the very cherty or extremely cherty analog of silt loam or of silty clay loam.

The Bt1 horizon has hue of 2.5YR, value of 3, 4, or 5, and chroma of 6 or 8, or it has hue of 5YR, value of 4, and chroma of 6 or 8; if the value is 3, the chroma is 6. The texture is the very cherty or extremely cherty analog of clay or of silty clay. The Bt2 and Bt3 horizons are similar to the Bt1 horizon except that in some pedons they have few to common mottles in shades of brown. The content of chert ranges from 35 to 70 percent in the BE and Bt1 horizons and 50 to 85 percent in the Bt2 and Bt3 horizons.

Peridge Series

The Peridge series consists of deep, well drained, moderately permeable soils that formed in loamy material. The soils are nearly level to gently sloping. They are on stream terraces and broad uplands. The native vegetation was mixed hardwoods. The slope is 1 to 8 percent.

Peridge soils are near Britwater, Captina, and Tonti soils. Britwater soils are on adjacent similar landscapes on terraces. They have a fine-loamy control section and have more gravel than Peridge soils. Captina and Tonti soils are on adjacent similar landscapes. Captina soils have a fragipan. Tonti soils have a fragipan and a fine-loamy control section.

Typical pedon of Peridge silt loam, 1 to 3 percent slopes, in a meadow in the NE1/4NE1/4NE1/4 sec. 17, T. 17 N., R. 27 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; very friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish red (5YR 4/6) silt loam; moderate medium subangular blocky structure; friable; many fine roots; thin patchy clay films on ped faces; strongly acid; clear wavy boundary.

Bt2—13 to 28 inches; red (2.5YR 4/6) silty clay loam; moderate fine and medium subangular blocky structure; firm; common fine roots; thin patchy clay films on ped faces; strongly acid; clear wavy boundary.

Bt3—28 to 50 inches; red (2.5YR 4/6) silty clay loam; many medium distinct dark red (2.5YR 3/6) and common medium prominent pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin continuous clay films on ped faces; 5 percent, by volume, fine sandstone pebbles; strongly acid; gradual wavy boundary.

Bt4—50 to 72 inches; yellowish red (5YR 4/6) silty clay loam; many medium pale brown (10YR 6/3) and red (2.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; thin and medium continuous clay films on ped faces; 10 percent, by volume, sandstone and chert pebbles; strongly acid.

The thickness of the solum and the depth to bedrock are more than 72 inches. The soil is very strongly acid to medium acid throughout, except where the surface layer has been limed.

The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3.

In some pedons there is a BE horizon. It is silt loam. It has hue of 7.5YR, value of 5, and chroma of 4 or 6, or it has hue of 5YR, value of 4, and chroma of 4.

The Bt1 horizon has hue of 5YR or 2.5YR, value of 4, and chroma of 6 or 8. It is silt loam or silty clay loam. The Bt2 horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 6 or 8, and it commonly has mottles in shades of brown. The content of gravel in the Bt1 and Bt2 horizons generally is less than 5 percent.

The Bt3 and Bt4 horizons have hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or they have hue of 2.5YR, value of 3 or 4, and chroma of 6. They are mottled in hue of 10YR with value of 5 and chroma of 4 or 6 or with value of 6 or 7 and chroma of 3. The Bt3 horizon is silty clay loam or gravelly silty clay loam. The Bt4 horizon is silty clay loam, silty clay, or the gravelly analogs. The content of gravel ranges from 0 to 30 percent.

Secesh Series

The Secesh series consists of deep, well drained, moderately permeable soils. The soils formed in gravelly, loamy sediment washed predominantly from soils that formed in residuum of cherty limestone. Secesh soils are level to nearly level. They are on flood plains along the smaller streams in the northern part of the county. The native vegetation was mixed bottomland hardwood trees. The slope is 0 to 3 percent.

Secesh soils are near Elsah, Britwater, and Waben soils. Elsah soils are on adjacent similar landscapes. They do not have an argillic horizon, and they have a loamy-skeletal control section. Britwater soils are on terraces. They have mixed mineralogy and do not have a mollic surface layer. Waben soils are on alluvial fans and terraces. They have a loamy-skeletal control section.

Typical pedon of Secesh gravelly silt loam, occasionally flooded, in a pasture in the SW1/4NW1/4NW1/4 sec. 14, T. 18 N., R. 27 W.

A—0 to 10 inches; dark brown (10YR 3/3) gravelly silt loam; moderate medium granular structure; friable; many fine and medium roots; 20 percent, by volume, chert gravel; slightly acid; clear wavy boundary.

Bt1—10 to 16 inches; dark brown (10YR 4/3) gravelly silt loam; moderate fine subangular blocky structure; friable; many fine roots; thin patchy clay films on faces of peds; 15 percent, by volume, chert gravel; medium acid; gradual wavy boundary.

Bt2—16 to 49 inches; reddish brown (5YR 4/4) gravelly silt loam; moderate fine subangular blocky structure; friable; common fine roots; thin patchy clay films on faces of peds; 20 percent, by volume, chert gravel; medium acid; clear wavy boundary.

Bt3—49 to 72 inches; reddish brown (5YR 4/4) very gravelly silty clay loam; moderate fine subangular and angular blocky structure; firm; thin patchy clay films on faces of peds; 60 percent, by volume, chert gravel; medium acid.

The solum is 60 to more than 80 inches thick. The A horizon is slightly acid or medium acid, and the B horizon is medium acid or strongly acid.

The A horizon is 7 to 18 inches thick. It has hue of 10YR, value of 3, and chroma of 2 or 3. The content of gravel is 15 to 35 percent.

In places there is a BE horizon. It is 4 to 8 inches thick. It has hue of 10YR, value of 4, and chroma of 3 or 4. The content of gravel is 15 to 35 percent.

The Bt horizon has hue of 5YR, value of 3 or 4, and chroma of 4; hue of 7.5YR, value of 4, and chroma of 4; or hue of 10YR, value of 4, and chroma of 3 or 4. It is silt loam or silty clay loam. The content of gravel is 15 to 35 percent in the upper part of the Bt horizon and 25 to 65 percent in the lower part. In some pedons there is a BC or C horizon that is very gravelly silt loam or very gravelly loam.

The Secesh soil in this survey area was correlated as a taxadjunct to the Secesh series because it has a slightly thicker A horizon and slightly more chert gravel in the upper part of the solum than allowed in the series. In addition, the base saturation commonly is slightly too high to qualify for the ultic subgroup. However, the behavior, use, and management of this soil are so similar to those of the Secesh series that a new series is not needed.

Steprock Series

The Steprock series consists of moderately deep, well drained, moderately permeable soils that formed in loamy residuum of interbedded sandstone, siltstone, and shale. The soils are gently sloping to very steep. They are on ridges, broad uplands, and side slopes. The native vegetation was upland hardwoods. The slope is 3 to 60 percent.

Steprock soils are near Enders, Linker, Nella, and Mountainburg soils. Enders soils are on ridgetops, hillsides, and mountainsides. They have a clayey control section and are more than 40 inches deep over shale. Linker soils are on gently sloping ridges and mountaintops. They have a fine-loamy control section. Nella soils are in more colluvial positions on mountainsides. They have a solum more than 60 inches thick and a fine-loamy control section. Mountainburg soils are in positions on the landscape similar to those of Steprock soils. Mountainburg soils, however, are less than 20 inches deep to bedrock.

Typical pedon of Steprock very stony loam, in an area of Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes, in a wooded area in the SE1/4SW1/4NW1/4 sec. 35, T. 14 N., R. 28 W.

A—0 to 1 inch; dark brown (10YR 4/3) very stony loam; weak fine granular structure; very friable; many fine roots; many medium pores; about 60 percent, by volume, sandstone fragments 2 to 16 inches in diameter; strongly acid; abrupt smooth boundary.

E—1 inch to 7 inches; yellowish brown (10YR 5/4) very stony loam; weak fine subangular blocky structure; very friable; many fine and medium roots; common medium pores; about 60 percent, by volume, sandstone fragments 2 to 16 inches in diameter; strongly acid; clear smooth boundary.

BE—7 to 11 inches; yellowish red (5YR 5/6) very gravelly loam; weak medium subangular blocky structure; friable; common fine roots; few fine pores; about 40 percent, by volume, sandstone fragments 0.5 inch to 4 inches in diameter; strongly acid; clear wavy boundary.

Bt1—11 to 30 inches; yellowish red (5YR 5/8) very gravelly clay loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; about 40 percent, by volume, sandstone fragments 0.5 inch to 4 inches in diameter; thin patchy clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—30 to 36 inches; red (2.5YR 5/6) very stony clay loam; few medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; about 50 percent, by volume, sandstone fragments 0.5 inch to 15 inches in diameter; thin continuous clay films on faces of peds; very strongly acid; abrupt wavy boundary.

Cr—36 to 40 inches; soft, thin-bedded, weathered sandstone; common fractures.

The solum is 20 to 40 inches thick. The depth to the Cr horizon ranges from 20 to 40 inches. The soil is strongly acid or very strongly acid throughout. The content of coarse fragments ranges from 20 to 70 percent, by volume, in the A and E horizons and 35 to 75 percent in the B horizons.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is gravelly loam, stony loam, or very stony loam. In cultivated areas there is an Ap horizon 5 to 8 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly loam or stony loam.

The E horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is gravelly loam, very gravelly loam, stony loam, or very stony loam.

The BE horizon has hue of 7.5YR or 5YR, value of 5, and chroma of 4, 6, or 8. It is very gravelly loam or very stony loam.

The Bt horizon has hue of 5YR, value of 4 or 5, and chroma of 6 or 8, or it has hue of 2.5YR, value of 4 or 5, and chroma of 6. In some pedons it has mottles in shades of brown or red. The texture is the very gravelly, extremely gravelly, or very stony analog of loam or clay loam. In places there is a BC horizon. It has colors similar to those of the Bt horizon. The texture of the BC horizon is the very gravelly or very stony analog of loam or sandy loam.

The Cr horizon is partly weathered sandstone or siltstone that has horizontal cleavage planes more than 4 inches apart.

The depth to unweathered hard bedrock is 5 feet or more.

Summit Variant

The Summit Variant consists of deep, moderately well drained, slowly permeable soils that formed in clayey residuum of weathered, calcareous shale and limestone. The soils are gently sloping to steep. They are on hillsides and foot slopes. The native vegetation was mixed hardwoods and redcedar. The slope is 3 to 25 percent.

Summit Variant soils are near Moko and Enders soils. Moko soils are on adjacent hillsides. They have a loamy-skeletal control section and are less than 20 inches deep to limestone bedrock. Enders soils are in similar positions, but they do not have a mollic epipedon and have lower base saturation than Summit Variant soils.

Typical pedon of Summit Variant stony silty clay loam, 12 to 25 percent slopes, in a range area in the SW1/4SW1/4NE1/4 sec. 31, T. 16 N., R. 27 W.

A—0 to 10 inches; very dark grayish brown (10YR 3/2) stony silty clay loam; strong medium and coarse granular structure; friable; many roots; 25 percent, by volume, sandstone fragments 3 to 16 inches in diameter; few limestone rocks 10 to 16 inches in diameter; slightly acid; gradual wavy boundary.

Bt1—10 to 19 inches; light olive brown (2.5Y 5/4) clay; many coarse distinct dark grayish brown (2.5Y 4/2) mottles; strong fine and medium angular blocky structure; firm, plastic; common roots; few sandstone pebbles; slightly acid; gradual wavy boundary.

Bt2—19 to 34 inches; olive brown (2.5Y 4/4) clay; common fine distinct grayish brown (2.5Y 5/2) mottles; weak fine subangular blocky structure; firm, plastic; few roots; common slickensides; neutral; gradual wavy boundary.

Bt3—34 to 56 inches; olive brown (2.5Y 4/4) clay; common medium distinct dark gray (2.5Y 4/1) mottles; weak fine subangular blocky structure; firm, plastic; few slickensides; neutral; gradual irregular boundary.

Cr—56 to 82 inches; weathered, soft, dark gray, laminar shale; easily cut with spade.

The thickness of the solum and the depth to shale bedrock are 40 to more than 60 inches. The A horizon and Bt1 horizon range from medium acid to neutral, and the Bt2 and Bt3 horizons range from slightly acid to moderately alkaline. The content of coarse fragments ranges from 0 to 30 percent, by volume, in the A horizon; in the Bt horizon it ranges from 0 to 10 percent.

The A horizon is 8 to 16 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or stony silty clay loam.

The Bt horizon has hue of 10YR, value of 3 or 4, and chroma of 1, 2, 3, or 4, or it has hue of 2.5Y, value of 3, 4, or 5, and chroma of 2 or 4; if the chroma is 2, the value is 4. The Bt horizon is mottled in shades of brown or gray. It is silty clay or clay.

Tonti Series

The Tonti series consists of deep, moderately well drained, slowly permeable soils that formed in residuum of weathered, cherty limestone. The soils are gently sloping. They are on ridgetops and broad uplands. The native vegetation was upland hardwoods. The slope is 3 to 8 percent.

Tonti soils are near Captina, Clarksville, Johnsburg, Nixa, Noark, and Peridge soils. Captina soils are on adjacent similar landscapes. They do not have a cherty surface layer and they have a fine-silty control section. Clarksville soils are on the lower part of side slopes. They do not have a fragipan. Johnsburg soils are on adjacent slighty depressional landscapes. They are somewhat poorly drained and have a fine-silty control section. Nixa soils are on adjacent ridges. They are very cherty throughout and have a loamy-skeletal control section. Noark soils are on the lower part of side slopes and on narrow ridges. They do not have a fragipan, and they have a clayey-skeletal control section. Peridge soils are on adjacent broad uplands. They do not have a fragipan, and they have a fine-silty control section.

Typical pedon of Tonti cherty silt loam, 3 to 8 percent slopes, in a pasture in the NE1/4SW1/4NW1/4 sec. 8, T. 17 N., R. 27 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) cherty silt loam; moderate medium granular structure; friable; many fine roots; 20 percent, by volume, angular chert fragments 0.5 inch to 3 inches in diameter; medium acid; abrupt smooth boundary.

BE—7 to 10 inches; yellowish brown (10YR 5/4) cherty silt loam; moderate fine subangular blocky structure; friable; many fine roots; 15 percent, by volume, angular chert fragments 0.5 inch to 3 inches in diameter; strongly acid; clear wavy boundary.

Bt—10 to 20 inches; yellowish brown (10YR 5/6) cherty silty clay loam; moderate subangular blocky structure; firm; common fine roots; patchy thin clay films; 20 percent, by volume, angular chert fragments 0.5 inch to 3 inches in diameter; strongly acid; clear wavy boundary.

Btx—20 to 34 inches; yellowish brown (10YR 5/6) very cherty silt loam; many prominent light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure parting to moderate fine subangular blocky; firm, brittle; few roots between prisms; continuous thin clay films; 40 percent, by volume, angular chert fragments 0.5 inch to 4 inches in diameter; strongly acid; clear wavy boundary.

B't1—34 to 44 inches; yellowish red (5YR 4/6) extremely cherty clay; many coarse prominent light gray (10YR 7/2) and common medium distinct red (2.5YR 4/6) mottles; moderate fine subangular and angular blocky structure; firm; few fine roots; continuous thin clay films; 65 percent, by volume, weathered and unweathered chert 0.5 inch to 6 inches in diameter; strongly acid; gradual wavy boundary.

B't2—44 to 72 inches; red (2.5YR 4/6) extremely cherty clay; common medium prominent pale brown (10YR 6/3) mottles; moderate fine and medium angular blocky structure; firm; continuous thin and medium clay films; 75 percent, by volume, chert 0.5 inch to 8 inches in diameter; strongly acid.

The fragipan is at a depth of 15 to 24 inches. The thickness of the solum and the depth to consolidated cherty limestone are more than 72 inches. The soil is strongly acid or very strongly acid throughout, except where it has been limed.

The Ap horizon is 5 to 9 inches thick. It has hue of 10YR, value of 4 or 5, and chroma of 3, or it has value of 4 and chroma of 2. Chert content ranges from 15 to 25 percent.

The BE horizon has hue of 10YR, value of 5 or 6, and chroma of 4. Chert content ranges from 10 to 20 percent.

The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6. Texture is cherty silt loam or cherty silty clay loam. Chert content ranges from 15 to 25 percent.

The Btx horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 or 6, and it commonly is mottled in shades of brown, red, and gray. Texture is cherty or very cherty silty clay loam or cherty or very cherty silt loam. Chert content ranges from 20 to 50 percent.

The B't1 and B't2 horizons have hue of 5YR, value of 4 or 5, and chroma of 4 or 6, or they have hue of 2.5YR, value of 3 or 4, and chroma of 6. They have mottles in shades of brown, red, and gray. Texture is very cherty or extremely cherty silty clay or very cherty or extremely cherty clay. Chert content ranges from 50 to 80 percent.

Waben Series

The Waben series consists of deep, well drained, moderately rapidly permeable soils that formed in very cherty alluvium and colluvium from residual soils that derived from weathered, cherty limestone. The soils are gently sloping to moderately sloping. They are on alluvial fans, foot slopes, and narrow terraces. The native vegetation was mixed hardwoods and scattered stands of pine. The slope is 3 to 12 percent.

Waben soils are near Britwater, Clarksville, Elsah, and Secesh soils. Britwater soils are on adjacent similar landscapes; they have a fine-loamy control section and mixed mineralogy. Clarksville soils are on adjacent steeper, higher hillsides; they have lower base saturation than Waben soils. Elsah soils are on adjacent lower lying flood plains; they do not have an argillic horizon. Secesh soils are also on lower lying flood plains; they have a fine-loamy control section.

Typical pedon of Waben very cherty silt loam, 3 to 12 percent slopes, in a pasture in the NW1/4NE1/4NE1/4 sec. 15, T. 17 N., R. 25 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) very cherty silt loam; moderate medium granular structure; very friable; many fine roots; 60 percent, by volume, chert 0.5 inch to 4 inches in diameter; medium acid; clear smooth boundary.

BE—8 to 13 inches; dark yellowish brown (10YR 4/4) very cherty silt loam; weak fine subangular blocky structure; friable; many fine roots; 50 percent, by volume, chert 0.5 inch to 3 inches in diameter; strongly acid; gradual wavy boundary.

Bt1—13 to 30 inches; strong brown (7.5YR 5/6) very cherty silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy clay films; 45 percent, by volume, chert 0.5 inch to 3 inches in diameter; strongly acid; gradual wavy boundary.

Bt2—30 to 57 inches; strong brown (7.5YR 5/6) very cherty silt loam; common medium yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; common fine roots; thin patchy clay films; 60 percent, by volume, chert 0.5 inch to 3 inches in diameter; strongly acid; gradual wavy boundary.

Bt3—57 to 72 inches; brown (7.5YR 5/4) extremely cherty silt loam; many coarse light yellowish brown (10YR 6/4) mottles; moderate fine subangular blocky structure; friable; few fine roots; thin patchy clay films; 75 percent, by volume, chert 0.5 inch to 4 inches in diameter; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The soil is medium acid or strongly acid throughout. The content of chert ranges from 35 to 75 percent throughout.

The Ap horizon is 5 to 8 inches thick. It has hue of 10YR, value of 4, and chroma of 3. In unplowed areas, the A horizon is 2 to 4 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. In some places there is an E horizon 3 to 8 inches thick. It has hue of 10YR, value of 5 or 6, and chroma of 3.

The BE horizon has hue of 10YR, value of 4 or 5, and chroma of 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. It is very cherty silt loam, extremely cherty silt loam, very cherty silty clay loam, or extremely cherty silty clay loam. It commonly is mottled in shades of brown in the lower part.

Formation of the Soils

Factors of Soil Formation

Soil is the class of three-dimensional natural bodies on the earth's surface that support plant life. The interaction of five main factors determines the properties of each soil and results in differences between soils (*10*). The factors are the physical and chemical composition of the parent material, the climate during and after the accumulation of the parent material, the kinds of plants and organisms living on and in the soil, the relief of the land and its effect on runoff, and the length of time during which the soil has formed. The influence of any factor can vary from place to place.

In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

Parent Material

Acid shale, sandstone, and cherty limestone are the dominant kinds of bedrock in Madison County. The bedrock is mainly of Mississippian and Pennsylvanian age; to a minor extent it is Ordovician (*4, 7*). Parent material has had a major effect on the soils in the county.

Madison County lies within the Ozark Plateaus Province, which comprises the Boston Mountains and the Springfield and Salem Plateaus.

The Boston Mountains cover about two-thirds of the county in the southern and central parts. The Boston Mountains contain the youngest formations and the highest surface elevations in the province.

The Atoka Formation, of Pennsylvanian age, caps the higher crests of the Boston Mountains in the southern part of the county. The Atoka Formation is primarily interbedded acid sandstone and shale. Thick beds of sandstone in the upper part commonly form prominent bluffs rimming the mountaintops. Linker soils are dominant on the broad mountaintops. Nella, Steprock, and Mountainburg soils are dominant on the upper part of the formation, which contains more sandstone, and Enders and Leesburg soils are dominant on the lower part, which contains more shale.

Below the Atoka Formation, at lower elevations, is the Bloyd Formation of the same period. It is primarily composed of acid shale interbedded with smaller amounts of limestone. Enders and Leesburg soils formed in this material.

The Hale Formation of the Pennsylvanian period underlies the Bloyd Formation. It is primarily sandstone and is interbedded with shale and limestone. Allen, Linker, Nella, and Mountainburg soils formed in this material (fig. 16).

The underlying Pitkin Limestone of the Mississippian period varies in thickness and commonly forms outcrops or bluffs. Summit Variant and Moko soils formed in these areas.

The Fayetteville Shale, of Mississippian age, makes up the lowermost part of the Boston Mountains. It is a dark, fissile clay shale and is capped by the Wedington Sandstone Member, which is more resistant to weathering. Linker and Mountainburg soils formed in material that weathered in place from the sandstone, and Enders and Leesburg soils formed in material that weathered mainly from the shale.

Most of the northern part of Madison County is on the Springfield Plateau. The Boone Formation of the Mississippian period covers most of the surface of the plateau except where fine-grained sandstone of the Batesville Formation of the same age caps the surface. The Boone Formation consists of alternating beds of limestone and chert or cherty limestone. The amount of chert varies both vertically and laterally within the formation. The limestone weathers more rapidly than the chert, so that a mantle of chert remains on the surface in sloping or dissected areas. Nixa, Clarksville, and Noark soils formed in these areas. Captina and Tonti soils, which contain relatively little chert, are in smoother areas. Peridge soils commonly formed in areas that are underlain by siltstone of the Batesville Formation. The basal member of the Boone Formation, the St. Joe Limestone, forms a prominent bluff in places.

Small areas of the Salem Plateau are exposed in deeply entrenched parts of northern Madison County. The largest area is in the extreme northern part of the county. In Madison County, the Salem Plateau consists mainly of the Chattanooga Formation of the Devonian period, which is a black, fissile clay shale, and the Everton Formation of the Ordovician period. The Everton Formation consists of limestone or dolomitic limestone and the Kings River Sandstone Member. Arkana and Moko soils are the dominant soils in these areas; Mountainburg soils, to a minor extent, are also present.

Ceda, Cleora, Elsah, Healing, and Secesh soils are on flood plains and low terraces. These soils formed in silty

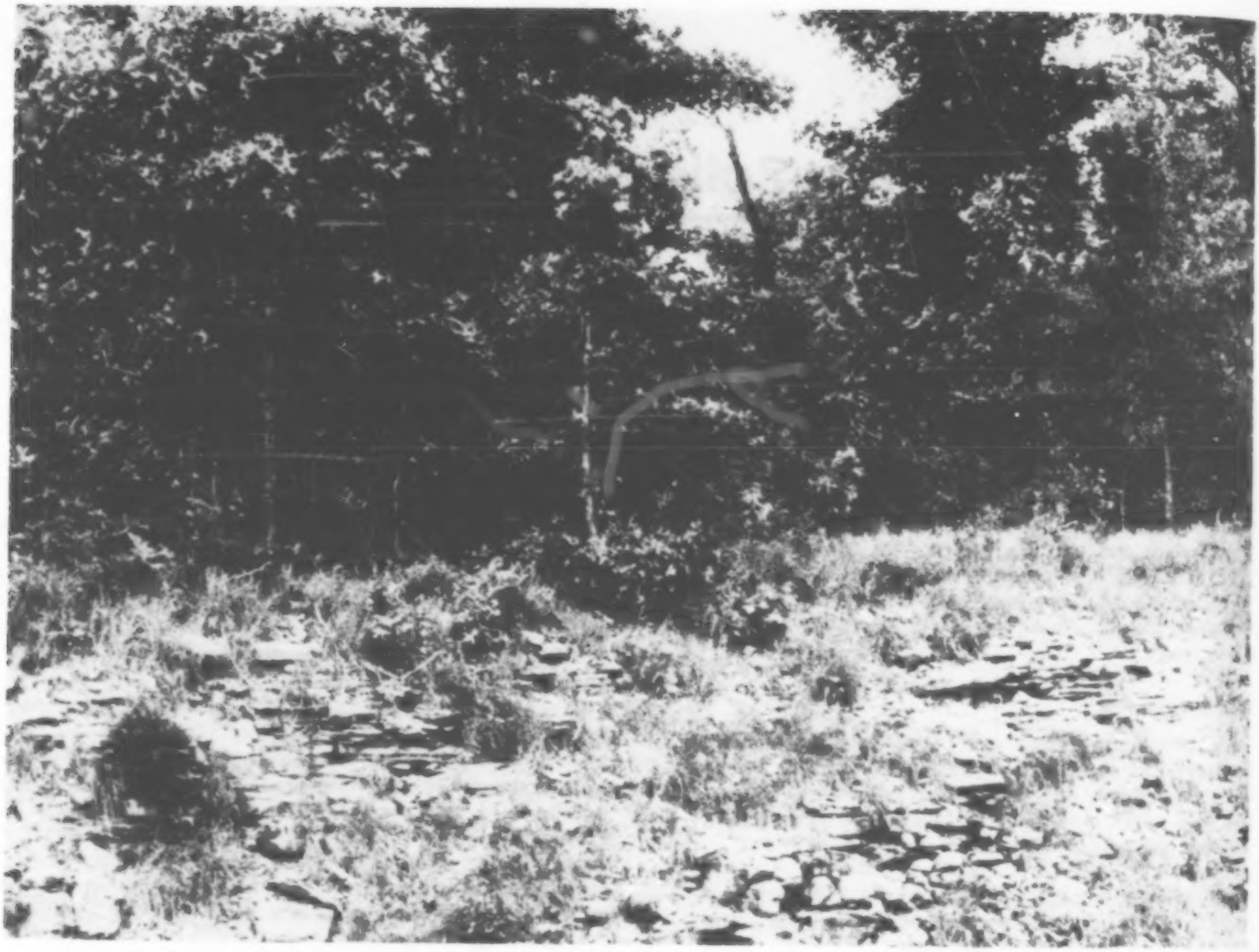


Figure 16.—Sandstone bedrock is the parent material of the shallow Mountainburg soils.

and loamy sediment washed from local uplands. They differ in the texture of the sediment, in the degree of horizon development, and in the amount of chert, gravel, or cobbles in the parent material.

Britwater, Allen, Waben, Leadvale, Johnsburg, Nella, and Leesburg soils formed in old alluvium or colluvium on stream terraces and valley foot slopes.

Climate

The climate in Madison County is characterized by relatively mild to cool winters, hot summers, and fairly abundant rainfall. The present climate probably is similar to the climate under which the soils formed. The average daily maximum temperature is about 90° F in July and 48° in January. Annual rainfall is about 44 inches and is generally well distributed throughout the year.

The warm, moist climate in the survey area promotes rapid soil formation and encourages rapid chemical reactions. The large amount of water that moves through the soil is instrumental in moving dissolved or suspended materials downward in the soil profile. Plant remains decompose rapidly, and the organic acid that forms hastens the removal of carbonates and the formation of clay.

Because the soil is frozen only to a shallow depth and for a relatively short period, soil formation continues almost the year round. The climate is relatively uniform throughout the survey area, but its effect is modified locally by elevation and slope aspect. Climate alone does not account for marked differences in the soils in the survey area.

Living Organisms

Plants and animals, including insects, bacteria, and fungi, are important in the formation of soils. Among the changes they cause are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity. In some cases they also cause physical mixing of soil layers directly as by burrowing or indirectly as by windthrow of trees.

Before Madison County was settled, the native vegetation had more influence on soil formation than did animal activity. Forests of hardwood trees or mixed hardwoods and shortleaf pine covered most of the county. The soils on the uplands in the northeastern part of the county are shallow or moderately deep and overlie limestone or dolomitic limestone. These soils supported savannas. The trees on the savannas were eastern redcedar or mixed eastern redcedar and hardwoods. Tall grasses grew in openings between the trees. Arkana and Moko soils are dominant in these areas. These soils have a surface layer that has been darkened to a depth of several inches by the accumulation of organic matter.

The native vegetation on most of the gently sloping to very steep, dissected uplands was an upland oak-hickory forest or a mixed stand of hardwoods and shortleaf pine. The soils in these areas have some accumulation of organic matter and are dark-colored only in the uppermost few inches. Clarksville, Enders, Leesburg, Linker, Mountainburg, Nella, Nixa, Noark, and Steprock soils formed on these uplands. The soils differ mainly in parent material, relief, age, and degree of weathering.

In the alluvial areas, the native vegetation was mainly such bottomland hardwood trees as hackberry, sycamore, elm, black walnut, sweetgum, ash, oak, and hickory. The understory vegetation was mainly cane, vines, and herbaceous plants. Healing, Ceda, Cleora, Elsah, and Secesh soils formed in these areas.

Variations in native vegetation in the county are related mainly to differences in the available water capacity of the soils. Differences in surface and internal drainage, slope aspect, and soil fertility also cause variations.

Only major differences in the original vegetation are reflected to any extent in the characteristics of the soils.

The activities of man are important to the future rate and direction of soil formation. Man clears the forest, cultivates the soil, and introduces new kinds of plants. He applies fertilizer, organic residue, lime, and chemicals to control insects, diseases, and weeds. He cultivates erodible soils, he uses or controls fire, he builds dams for flood control, he cuts and fills and grades and compacts the soil surface, and he covers the surface with structures and pavements. Some of the results of these actions will not become known for many centuries. Nevertheless, the way that other living organisms affect soil formation in the county has been drastically changed by man.

Relief

The relief in Madison County is the result of geologic erosion, of the entrenchment of streams and drainage channels, and, in a few places, of faulting. The highest elevation in Madison County, about 2,447 feet above sea level, is about 4 miles south of the community of Red Star in the southeastern part of the county. The lowest point, about 1,080 feet above sea level, is in the northeastern part where the Kings River leaves the county.

Some of the greatest differences in the soils of Madison County are caused by differences in relief through its effect on drainage, runoff, erosion, and percolation of water through the soil. The landscape ranges from nearly vertical bluffs to broad, nearly level and gently sloping areas.

Some soils on the steeper slopes, narrow ridges, and mountaintops are shallow because the soil material is lost through geologic erosion almost at the same rate at which it forms. Moko and Mountainburg soils are examples. In other areas of strong relief, the soils formed in cherty limestone. Clarksville and Noark soils, for example, contain large quantities of chert residue from weathered limestone. The chert mantle retards geologic erosion. In contrast, soils that are on nearly level to gently sloping uplands, for example, Captina, Peridge, and Linker soils, have lost little soil material through geologic erosion.

Nella and Leesburg soils formed on colluvial slopes in deep accumulations of material that washed or sloughed down from adjacent higher slopes. Leadvale, Allen, and Britwater soils, which are on gently sloping stream terraces, formed in deep, loamy material that washed from uplands and was deposited on stream flood plains before the streams became further entrenched.

The soils on present flood plains and on low terraces along streams in the survey area are level to nearly level and are subject to flooding. Cleora, Ceda, Elsah, Healing, and Secesh soils formed in these areas in deep, silty or loamy alluvium that in some places contains chert or gravel.

Some soils formed in slight depressions on broad uplands or stream terraces. Johnsburg and Mayes soils formed in these areas.

Time

The length of time required for soils to form depends largely on other factors of soil formation. Generally, less time is required if the climate is warm and humid and the vegetation luxuriant. If other factors are equal, less time is required if the parent material is loamy than if it is clayey.

In terms of geologic time, most of the soils in Madison County are old, regardless of whether they are on mountaintops, hillsides, or stream terraces. The young soils formed either in recent alluvium along streams or in residuum where geologic erosion has nearly kept pace with weathering of the bedrock.

The soils on uplands formed in material that weathered from rocks of Ordovician to Pennsylvanian age. Most of these soils are old. Most of the cations have been leached out, and the reaction is strongly acid or very strongly acid. There has been considerable weathering and translocation of clay, and the horizons are clearly expressed. Iron, as well as clay, has been translocated from the A horizon to the B horizon and then oxidized, giving the B horizon stronger red, brown, and yellow colors than the A horizon. Captina, Nella, Enders, Linker, Leesburg, Noark, and Peridge soils clearly show the effect of time acting with other soil-forming factors on parent material.

Cleora, Ceda, and Elsah soils are young soils. They formed in recent alluvium on flood plains. No definite horizons have formed below the A horizon. Instead, these soils still exhibit depositional bedding planes and have no soil structure. Base saturation is high, and the reaction generally is medium acid to slightly acid, indicating that leaching has been slight. The content of organic matter decreases irregularly with depth. Except for the slight changes caused by worms and roots, there is little evidence of soil-forming activity.

Healing and Secesh soils are intermediate in age. They formed in silty alluvium on flood plains and low terraces of large streams. Horizonation is weakly expressed, but there is evidence of clay translocation.

Soil Horizon Differentiation

The effects of the soil-forming factors are reflected in the soil profile, which is a succession of layers, or horizons, from the surface down to the parent material. The parent material has been little altered by soil-forming processes. The horizons differ in one or more properties, such as color, texture, structure, consistence, porosity, or reaction.

Most soil profiles contain four major soil genetic horizons, the A, E, B, and C horizons. Young soils do not have a B horizon.

The horizon of maximum accumulation of organic matter is called the A horizon, or the surface layer. An Ap horizon is a plowed surface layer.

The horizon of maximum leaching of dissolved or suspended materials is called the E horizon, or the subsurface layer.

The B horizon lies immediately below the A or E horizon and is sometimes called the subsoil (*15*). It is the horizon of maximum accumulation of dissolved or suspended materials, such as iron and clay. The B horizon commonly has blocky structure and is firmer than the horizons immediately above or below it.

The C horizon lies below the B horizon. Typically, it has been little affected by the soil-forming processes, though in some places it is materially modified by weathering. In some young soils, the C horizon has been only slightly modified by living organisms and by weathering, and it immediately underlies the A horizon.

In the survey area, several processes have been active in the formation of soil horizons. Among these processes are the accumulation of organic matter; the leaching of carbonates and bases; the oxidation, reduction, and transfer of iron; and the formation and translocation of silicate clay minerals. In most of the soils, more than one of these processes were involved.

The physical weathering of rocks, through heating and cooling and wetting and drying, slowly breaks the rocks into small pieces that form the parent material of residual soils. The effects of weathering are most evident in Moko and Mountainburg soils.

The accumulation of organic matter in the uppermost part of the profile (A horizon) is readily evident in the Nixa and Enders soils. These soils have a light-colored subsurface layer from which organic matter, clay, and iron oxides have been removed.

Leaching of carbonates and bases has occurred to some degree in nearly all the soils in the survey area. Generally, bases are leached downward in soil before silicate clay minerals begin to move. Most of the soils in the survey area are strongly leached. Healing and Cleora soils are moderately leached, and Summit Variant and Mayes soils are only slightly leached.

Oxidation of iron is evident in the moderately well drained and well drained soils, for example, Peridge, Linker, and Nella soils. Red or brown colors in the B horizon indicate the oxidation of iron.

The reduction and transfer of iron has occurred to a significant degree in poorly drained and somewhat poorly drained soils. This process is called gleying. Gray colors or gray mottles below the surface layer indicate the reduction and loss of iron. Some horizons contain red, brown, or yellow mottles and dark concretions of iron or manganese oxide. Gleying is most pronounced in the Mayes and Johnsburg soils.

The translocation of silicate clay minerals has contributed to horizon development in most of the soils in the county. In areas where the soils are or have been cultivated, most of the eluviated E horizon has been effaced by tillage. Where it remains distinct, the E horizon has blocky to granular structure, has less clay than the lower horizons, and is lighter colored than the rest of the soil. Generally, clay has accumulated as films or coatings in pores and on the surface of peds in the B horizon. The soils were probably leached of carbonates and soluble salts to a great extent before the translocation of silicate clay occurred. Enders and Noark soils show the effects of these processes.

In Madison County, leaching of bases and translocation of silicate clay are among the most important processes of horizon differentiation.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1964-79 at Huntsville, Arkansas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	47.5	22.4	35.0	72	-6	30	2.11	0.93	3.10	4	4.2
February---	51.8	26.6	39.2	73	1	19	2.58	1.37	3.64	4	3.9
March------	60.6	35.0	47.8	83	11	147	4.14	1.80	6.12	6	2.9
April------	72.4	45.7	59.1	88	25	278	5.21	3.11	7.09	7	.3
May--------	77.6	52.2	64.9	89	34	462	4.34	2.34	6.09	7	.0
June-------	84.9	59.7	72.3	95	42	669	4.49	2.88	5.95	6	.0
July-------	89.6	63.9	76.8	100	46	831	3.29	1.33	4.94	5	.0
August-----	88.4	61.6	75.0	101	47	775	3.00	1.41	4.35	5	.0
September--	81.6	56.4	69.0	94	34	570	4.67	1.96	6.95	5	.0
October----	73.2	44.3	58.8	90	25	279	3.26	.80	5.24	4	.0
November---	60.5	36.2	48.4	79	10	111	3.66	1.44	5.51	5	1.4
December---	52.1	28.0	40.1	73	1	6	3.33	1.55	4.86	5	1.8
Yearly:											
Average--	70.0	44.3	57.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-9	---	---	---	---	---	---
Total----	---	---	---	---	---	4,177	44.08	37.09	50.76	63	14.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1964-79 at Huntsville, Arkansas]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 8	April 16	May 1
2 years in 10 later than--	April 3	April 12	April 26
5 years in 10 later than--	March 24	April 5	April 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 26	October 9	September 29
2 years in 10 earlier than--	November 1	October 15	October 3
5 years in 10 earlier than--	November 13	October 25	October 10

TABLE 3.--GROWING SEASON

[Recorded in the period 1964-79 at Huntsville, Arkansas]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	206	187	160
8 years in 10	215	192	165
5 years in 10	233	203	176
2 years in 10	251	214	187
1 year in 10	260	219	193

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Allen loam, 3 to 8 percent slopes	1,860	0.4
2	Arkana very cherty silt loam, 8 to 15 percent slopes	725	0.1
3	Arkana-Moko complex, 8 to 20 percent slopes	1,195	0.2
4	Arkana-Moko complex, 20 to 40 percent slopes	1,930	0.4
5	Britwater gravelly silt loam, 3 to 8 percent slopes	1,205	0.2
6	Captina silt loam, 1 to 3 percent slopes	2,515	0.5
7	Ceda gravelly fine sandy loam, occasionally flooded	7,870	1.5
8	Ceda cobbly fine sandy loam, frequently flooded	8,515	1.6
9	Clarksville very cherty silt loam, 20 to 50 percent slopes	32,810	6.1
10	Cleora fine sandy loam, occasionally flooded	5,480	1.0
11	Elsah very cherty silt loam, occasionally flooded	2,905	0.5
12	Enders gravelly loam, 3 to 8 percent slopes	4,145	0.8
13	Enders gravelly loam, 8 to 12 percent slopes	2,160	0.4
14	Enders stony loam, 3 to 12 percent slopes	14,750	2.8
15	Enders-Leesburg stony loams, 8 to 20 percent slopes	110,575	20.7
16	Enders-Leesburg stony loams, 20 to 40 percent slopes	97,970	18.4
17	Healing silt loam, 1 to 3 percent slopes	4,315	0.8
18	Johnsburg silt loam, 0 to 1 percent slopes	1,875	0.3
19	Leadvale loam, 3 to 8 percent slopes	6,145	1.1
20	Leesburg gravelly loam, 3 to 8 percent slopes	2,700	0.5
21	Leesburg gravelly loam, 8 to 12 percent slopes	1,245	0.2
22	Leesburg stony loam, 8 to 20 percent slopes	10,340	1.9
23	Linker loam, 3 to 8 percent slopes	9,370	1.7
24	Mayes silty clay loam, 0 to 1 percent slopes	595	0.1
25	Moko very stony silt loam, very rocky, 12 to 40 percent slopes	890	0.2
26	Mountainburg gravelly loam, 3 to 12 percent slopes	970	0.2
27	Mountainburg stony loam, 3 to 20 percent slopes	10,840	2.0
28	Mountainburg very stony loam, 20 to 50 percent slopes	9,615	1.8
29	Nella gravelly loam, 3 to 8 percent slopes	1,725	0.3
30	Nella gravelly loam, 8 to 12 percent slopes	1,420	0.3
31	Nella gravelly loam, 12 to 20 percent slopes	4,110	0.8
32	Nella stony loam, 8 to 20 percent slopes	12,620	2.4
33	Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes	46,295	8.6
34	Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes	16,425	3.1
35	Nixa very cherty silt loam, 3 to 8 percent slopes	18,415	3.4
36	Nixa very cherty silt loam, 8 to 15 percent slopes	19,760	3.7
37	Noark very cherty silt loam, 8 to 12 percent slopes	2,255	0.4
38	Noark very cherty silt loam, 12 to 20 percent slopes	4,530	0.8
39	Noark very cherty silt loam, 20 to 45 percent slopes	19,215	3.6
40	Peridge silt loam, 1 to 3 percent slopes	1,845	0.3
41	Peridge silt loam, 3 to 8 percent slopes	3,925	0.7
42	Secesh gravelly silt loam, occasionally flooded	2,045	0.4
43	Steprock gravelly loam, 3 to 8 percent slopes	11,075	2.1
44	Steprock stony loam, 3 to 12 percent slopes	6,950	1.3
45	Summit Variant silty clay loam, 3 to 12 percent slopes	200	*
46	Summit Variant stony silty clay loam, 12 to 25 percent slopes	790	0.1
47	Tonti cherty silt loam, 3 to 8 percent slopes	6,250	1.2
48	Waben very cherty silt loam, 3 to 12 percent slopes	621	0.1
	Total	535,981	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Soybeans	Corn	Alfalfa hay	Tall fescue hay	Hybrid bermudagrass hay	Tall fescue	Improved bermudagrass
	Bu	Bu	Tons	Tons	Tons	AUM*	AUM*
1-------------------------- Allen	25	75	4.5	4.0	5.0	7.0	8.0
2-------------------------- Arkana	---	---	---	---	---	4.5	---
3-------------------------- Arkana-Moko	---	---	---	---	---	3.0	---
4-------------------------- Arkana-Moko	---	---	---	---	---	---	---
5-------------------------- Britwater	20	55	---	3.0	4.0	6.5	7.0
6-------------------------- Captina	25	65	---	3.5	4.5	7.0	7.5
7-------------------------- Ceda	---	70	4.5	4.0	5.0	7.5	8.5
8-------------------------- Ceda	---	---	---	---	---	6.0	7.0
9-------------------------- Clarksville	---	---	---	---	---	3.5	---
10------------------------- Cleora	30	80	5.0	4.0	6.0	8.0	9.5
11------------------------- Elsah	---	---	---	3.5	4.5	7.0	7.5
12------------------------- Enders	---	---	---	2.5	---	4.0	4.0
13------------------------- Enders	---	---	---	2.0	---	4.0	3.5
14------------------------- Enders	---	---	---	---	---	3.5	---
15------------------------- Enders-Leesburg	---	---	---	---	---	3.5	---
16------------------------- Enders-Leesburg	---	---	---	---	---	3.5	---
17------------------------- Healing	35	90	5.5	4.5	6.0	8.5	10.0
18------------------------- Johnsburg	25	60	---	3.0	4.0	6.0	6.5
19------------------------- Leadvale	25	60	---	3.0	4.0	6.0	6.5
20------------------------- Leesburg	25	60	---	3.0	4.0	6.0	6.5
21------------------------- Leesburg	---	---	---	3.0	4.0	6.0	6.5

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Soybeans	Corn	Alfalfa hay	Tall fescue hay	Hybrid bermudagrass hay	Tall fescue	Improved bermudagrass
	Bu	Bu	Tons	Tons	Tons	AUM*	AUM*
22----- Leesburg	---	---	---	---	---	5.5	---
23----- Linker	20	55	---	3.0	4.0	6.0	6.5
24----- Mayes	---	---	---	3.0	4.0	6.0	6.5
25----- Moko	---	---	---	---	---	2.0	---
26----- Mountainburg	---	---	---	---	---	3.5	---
27----- Mountainburg	---	---	---	---	---	3.0	---
28----- Mountainburg	---	---	---	---	---	3.0	---
29----- Nella	25	65	---	3.5	4.0	6.5	7.0
30----- Nella	---	---	---	3.0	4.0	6.5	7.0
31----- Nella	---	---	---	3.0	4.0	6.0	6.5
32----- Nella	---	---	---	---	---	6.0	---
33----- Nella-Steprock-Mountainburg	---	---	---	---	---	4.0	---
34----- Nella-Steprock-Mountainburg	---	---	---	---	---	---	---
35----- Nixa	---	---	---	---	---	5.0	5.0
36----- Nixa	---	---	---	---	---	5.0	5.0
37----- Noark	---	---	---	---	---	6.0	6.0
38----- Noark	---	---	---	---	---	5.5	---
39----- Noark	---	---	---	---	---	5.0	---
40----- Peridge	30	80	4.5	4.0	5.5	8.0	9.0
41----- Peridge	25	75	4.5	4.0	5.0	7.5	8.5
42----- Secesh	30	75	4.5	4.0	5.5	8.0	9.0
43----- Steprock	15	---	---	3.0	3.5	5.0	5.5
44----- Steprock	---	---	---	---	---	4.5	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURM--Continued

Map symbol and soil name	Soybeans	Corn	Alfalfa hay	Tall fescue hay	Hybrid bermudagrass hay	Tall fescue	Improved bermudagrass
	Bu	Bu	Tons	Tons	Tons	AUM*	AUM*
45------------------------ Summit Variant	---	---	---	3.0	3.5	6.0	6.0
46------------------------ Summit Variant	---	---	---	---	---	5.0	---
47------------------------ Tonti	20	---	---	3.0	4.0	6.0	6.5
48------------------------ Waben	---	---	---	3.0	4.0	6.0	6.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
1 Allen	3o7	Slight	Slight	Slight	Shortleaf pine*	66	Shortleaf pine, northern red oak, white oak.
2 Arkana	5c8	Slight	Moderate	Moderate	Shortleaf pine*	55	Shortleaf pine, eastern redcedar.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
3**:							
Arkana	5c8	Slight	Moderate	Moderate	Shortleaf pine*	55	Shortleaf pine, eastern redcedar.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar*	30	Eastern redcedar.
4**:							
Arkana	5c9	Moderate	Moderate	Moderate	Shortleaf pine*	55	Shortleaf pine, eastern redcedar.
					Southern red oak	55	
					Eastern redcedar	35	
					White oak	---	
Moko	5x3	Severe	Severe	Severe	Eastern redcedar*	30	Eastern redcedar.
5 Britwater	3o7	Slight	Slight	Slight	Shortleaf pine*	70	Shortleaf pine, northern red oak, eastern redcedar, loblolly pine.
					Southern red oak	70	
					Eastern redcedar	50	
					Loblolly pine	80	
6 Captina	4o7	Slight	Slight	Slight	Shortleaf pine*	56	Shortleaf pine, northern red oak.
7, 8 Ceda	3f8	Slight	Slight	Moderate	Shortleaf pine*	70	Loblolly pine, shortleaf pine, American sycamore, sweetgum.
					Southern red oak	---	
					White oak	---	
					Sweetgum	80	
					American sycamore	80	
9 Clarksville	4f9	Moderate	Severe	Severe	Shortleaf pine*	56	White oak, shortleaf pine, sweetgum, green ash.
					White oak	57	
10 Cleora	2o4	Slight	Slight	Slight	Eastern cottonwood*	100	Sweetgum, eastern cottonwood, black walnut, black cherry, American sycamore, white ash, northern red oak, white oak.
					Northern red oak	80	
					Sweetgum	90	
11 Elsah	3f5	Slight	Slight	Moderate	Eastern cottonwood*	95	Black walnut, green ash, sweetgum.
					American sycamore	---	
					Sweetgum	---	
					Red maple	---	
12, 13 Enders	4o1	Slight	Slight	Slight	Shortleaf pine*	60	Loblolly pine, shortleaf pine.
					Southern red oak	60	
					White oak	55	
14 Enders	4x2	Slight	Moderate	Moderate	Shortleaf pine*	60	Loblolly pine, shortleaf pine, eastern redcedar.
					Southern red oak	60	
					White oak	55	
					Eastern redcedar	40	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
15**:							
Enders	4x2	Slight	Moderate	Slight	Shortleaf pine*	60	Loblolly pine, shortleaf pine, eastern redcedar.
					Southern red oak	60	
					White oak	55	
					Eastern redcedar	40	
Leesburg	3x8	Slight	Moderate	Slight	Shortleaf pine*	66	Loblolly pine, shortleaf pine, white oak.
					Loblolly pine	70	
					White oak	70	
16**:							
Enders (south slope)	5r3	Moderate	Moderate	Moderate	Shortleaf pine*	50	Loblolly pine, shortleaf pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	35	
Enders (north slope)	4r9	Moderate	Moderate	Moderate	Shortleaf pine*	60	Loblolly pine, shortleaf pine, eastern redcedar.
					Southern red oak	60	
					White oak	60	
					Eastern redcedar	45	
Leesburg (south slope)	4x3	Moderate	Moderate	Moderate	Shortleaf pine*	60	Loblolly pine, shortleaf pine.
					Loblolly pine	65	
					White oak	65	
Leesburg (north slope)	3x9	Moderate	Moderate	Moderate	Shortleaf pine*	60	Loblolly pine, shortleaf pine.
					Loblolly pine	70	
					White oak	70	
17 Healing	2o7	Slight	Slight	Slight	Shortleaf pine*	80	Shortleaf pine, loblolly pine, white oak, American sycamore, eastern cottonwood, black walnut.
					Southern red oak	80	
					White oak	70	
					American sycamore	80	
					Eastern cottonwood	90	
18 Johnsburg	3w8	Slight	Moderate	Slight	White oak*	70	Shortleaf pine, white ash, loblolly pine, American sycamore.
					Northern red oak	75	
					Pin oak	85	
					Sweetgum	80	
19 Leadvale	3o7	Slight	Slight	Slight	Loblolly pine*	80	Loblolly pine, shortleaf pine.
					White oak	70	
					Shortleaf pine	70	
20, 21 Leesburg	3o7	Slight	Slight	Slight	Shortleaf pine*	66	Loblolly pine, shortleaf pine.
					White oak	70	
					Loblolly pine	70	
22 Leesburg	3x8	Slight	Moderate	Slight	Shortleaf pine*	66	Loblolly pine, shortleaf pine, white oak.
					Loblolly pine	70	
					White oak	70	
23 Linker	4o1	Slight	Slight	Slight	Shortleaf pine*	60	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	40	
24 Mayes	4w6	Slight	Severe	Moderate	Post oak*	60	Sweetgum, green ash.
					Sweetgum	70	
					Green ash	---	
25 Moko	5x3	Severe	Severe	Severe	Eastern redcedar*	30	Eastern redcedar.
26 Mountainburg	5d2	Slight	Slight	Moderate	Shortleaf pine*	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
27 Mountainburg	5x2	Slight	Moderate	Moderate	Shortleaf pine*	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
28 Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine*	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
29, 30, 31 Nella	3o7	Slight	Slight	Slight	Shortleaf pine*	71	Shortleaf pine, loblolly pine, black walnut.
					Northern red oak	71	
					Eastern redcedar	61	
					Black walnut	---	
					White oak	---	
32 Nella	3x8	Slight	Moderate	Slight	Shortleaf pine*	66	Shortleaf pine, loblolly pine, black walnut.
					Southern red oak	60	
					Eastern redcedar	40	
					Black oak	---	
					Black walnut	---	
					White oak	---	
33**:							
Nella (south slope)	4x9	Moderate	Moderate	Slight	Shortleaf pine*	60	Shortleaf pine, loblolly pine.
					Southern red oak	60	
					Eastern redcedar	40	
					Black oak	---	
					White oak	---	
Nella north slope)	3x9	Moderate	Moderate	Slight	Shortleaf pine*	70	Shortleaf pine, loblolly pine, black walnut, sugar maple.
					Northern red oak	70	
					Eastern redcedar	60	
					Loblolly pine	80	
					Black walnut	---	
					White oak	---	
					Sugar maple		
Steprock (south slope)	5x9	Moderate	Severe	Slight	Shortleaf pine*	50	Shortleaf pine, eastern redcedar.
					Southern red oak	45	
					White oak	45	
					Eastern redcedar	35	
Steprock (north slope)	4x9	Moderate	Severe	Slight	Shortleaf pine*	56	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	50	
					White oak	50	
					Eastern redcedar	35	
					Loblolly pine	---	
Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine*	50	Shortleaf pine, eastern redcedar, loblolly pine.
					Eastern redcedar	30	
					Loblolly pine	---	
34**:							
Nella (south slope)	4x9	Severe	Severe	Slight	Shortleaf pine*	60	Shortleaf pine, loblolly pine.
					Southern red oak	60	
					Eastern redcedar	40	
					Black oak	---	
					White oak	---	
Nella (north slope)	3x9	Severe	Severe	Slight	Shortleaf pine*	70	Shortleaf pine, loblolly pine, black walnut, northern red oak, white oak, sugar maple.
					Northern red oak	70	
					Eastern redcedar	60	
					Loblolly pine	80	
					Black walnut	---	
					White oak	---	
					Sugar maple	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
34**: Steprock (south slope)	5x9	Severe	Severe	Slight	Shortleaf pine*	50	Shortleaf pine, eastern redcedar.
					Southern red oak	40	
					White oak	40	
					Eastern redcedar	35	
Steprock (north slope)	4x9	Severe	Severe	Slight	Shortleaf pine*	56	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	45	
					White oak	45	
					Eastern redcedar	35	
					Loblolly pine	---	
Mountainburg	5x3	Severe	Severe	Moderate	Shortleaf pine*	50	Shortleaf pine, loblolly pine, eastern redcedar.
					Eastern redcedar	30	
					Loblolly pine	---	
35, 36 Nixa	4f8	Slight	Slight	Moderate	Shortleaf pine*	60	Shortleaf pine, loblolly pine, eastern redcedar, black locust, southern red oak.
					Southern red oak	60	
					White oak	60	
					Eastern redcedar	40	
					Black walnut	---	
					Black locust	---	
37, 38 Noark	4f8	Slight	Moderate	Moderate	Shortleaf pine*	65	Shortleaf pine, loblolly pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
39 Noark	4r9	Moderate	Severe	Moderate	Shortleaf pine*	65	Shortleaf pine, loblolly pine, eastern redcedar, southern red oak.
					Eastern redcedar	40	
					Southern red oak	60	
					White oak	---	
40, 41 Peridge	3o7	Slight	Slight	Slight	Shortleaf pine*	70	Shortleaf pine, loblolly pine, black walnut, white ash, eastern redcedar.
					Southern red oak	70	
					Eastern redcedar	50	
					Black walnut	---	
					White oak	---	
					White ash	---	
					Black cherry	---	
42 Secesh	3o7	Slight	Slight	Slight	White oak*	70	Loblolly pine, black walnut, shortleaf pine, American sycamore, white oak.
					Shortleaf pine	---	
					American sycamore	---	
					Black walnut	---	
					Black oak	---	
43 Steprock	4o1	Slight	Slight	Slight	Shortleaf pine*	56	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	45	
					White oak	45	
					Eastern redcedar	35	
					Loblolly pine	---	
44 Steprock	4x2	Slight	Moderate	Slight	Shortleaf pine*	55	Shortleaf pine, loblolly pine, eastern redcedar.
					Southern red oak	45	
					White oak	45	
					Eastern redcedar	35	
					Loblolly pine	---	
45 Summit Variant	4c8	Slight	Slight	Moderate	Eastern redcedar*	40	Eastern redcedar, honeylocust.
					Hackberry	50	
					Honeylocust	50	
46 Summit Variant	4c8	Moderate	Moderate	Moderate	Eastern redcedar*	40	Eastern redcedar.
					Hackberry	50	
					Honeylocust	50	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Woodland suitability group	Management concerns			Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Common trees	Site index	
47 Tonti	4o7	Slight	Slight	Slight	Shortleaf pine*	60	Shortleaf pine, eastern redcedar, black walnut, black locust.
					Southern red oak	65	
					Black locust	---	
					Black walnut	---	
					Eastern redcedar	40	
48 Waben	3f8	Slight	Slight	Moderate	Shortleaf pine*	70	Shortleaf pine, loblolly pine, eastern redcedar, black walnut.
					Southern red oak	70	
					Eastern redcedar	40	
					Loblolly pine	---	
					Black walnut	---	
					Black cherry	---	
					Black locust	---	
					White oak	---	

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* Species is the indicator for site index data.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Allen	Slight	Slight	Moderate: slope, small stones.	Slight.
2 Arkana	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
3*: Arkana	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
Moko	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones.
4*: Arkana	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: slope.
Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
5 Britwater	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
6 Captina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.
7 Ceda	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Slight.
8 Ceda	Severe: flooding, large stones.	Severe: large stones.	Severe: flooding, large stones.	Moderate: flooding.
9 Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
10 Cleora	Severe: flooding.	Slight	Moderate: flooding.	Slight.
11 Elsah	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Slight.
12 Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
13 Enders	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Slight.
14 Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily.
15*: Enders	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily.
Leesburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
16*: Enders	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: slope, erodes easily.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17 Healing	Severe: flooding.	Slight	Moderate: slope.	Slight.
18 Johnsburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.
19 Leadvale	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.
20 Leesburg	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
21 Leesburg	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope, small stones.	Slight.
22 Leesburg	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
23 Linker	Slight	Slight	Moderate: slope, small stones.	Slight.
24 Mayes	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.
25 Moko	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
26 Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
27 Mountainburg	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, small stones.
28 Mountainburg	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
29 Nella	Slight	Slight	Moderate: slope.	Slight.
30 Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
31 Nella	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
32 Nella	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: large stones.
33*, 34*:				
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
Mountainburg	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
35 Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: erodes easily, small stones.
36 Nixa	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: slope, small stones, percs slowly.	Severe: erodes easily, small stones.
37 Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
38 Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.
39 Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
0, 41 Peridge	Slight	Slight	Moderate: slope.	Slight.
2 Secesh	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight.
3 Steprock	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
44-------------------- Steprock	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Moderate: large stones.
45-------------------- Summit Variant	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.
46-------------------- Summit Variant	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.
47-------------------- Tonti	Moderate: percs slowly, wetness, small stones.	Moderate: wetness, percs slowly, small stones.	Moderate: percs slowly, slope, wetness.	Severe: erodes easily.
48-------------------- Waben	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1------------------ Allen	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
2------------------ Arkana	Fair	Good	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
3*: Arkana------------	Fair	Good	Fair	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.
Moko--------------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
4*: Arkana------------	Very poor.	Fair	Fair	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.
Moko--------------	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
5------------------ Britwater	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
6------------------ Captina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
7, 8--------------- Ceda	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
9------------------ Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
10----------------- Cleora	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
11----------------- Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
12, 13------------- Enders	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14----------------- Enders	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
15*: Enders------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Leesburg----------	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
16*: Enders------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Leesburg----------	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
17----------------- Healing	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
18----------------- Johnsburg	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
19------------------ Leadvale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20, 21-------------- Leesburg	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
22------------------ Leesburg	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
23------------------ Linker	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
24------------------ Mayes	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
25------------------ Moko	Very poor.	Poor	Poor	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
26------------------ Mountainburg	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
27, 28-------------- Mountainburg	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
29, 30-------------- Nella	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
31------------------ Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
32------------------ Nella	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
33*:										
Nella---------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Steprock------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Mountainburg--------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
34*:										
Nella---------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Steprock------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Mountainburg--------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.
35------------------ Nixa	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
36------------------ Nixa	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
37------------------ Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
38------------------ Noark	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
39------------------ Noark	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
40----------------- Peridge	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
41----------------- Peridge	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
42----------------- Secesh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
43, 44------------- Steprock	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
45----------------- Summit Variant variant	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
46----------------- Summit Variant	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
47----------------- Tonti	Fair	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Very poor.
48----------------- Waben	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1----------------- Allen	Moderate: too clayey.	Slight-----------	Slight-----------	Moderate: slope.	Moderate: low strength.
2----------------- Arkana	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
3*:					
Arkana-----------	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Moko-------------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
4*:					
Arkana-----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Moko-------------	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
5----------------- Britwater	Slight-----------	Slight-----------	Slight-----------	Moderate: slope.	Slight.
6----------------- Captina	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: low strength.
7----------------- Ceda	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
8----------------- Ceda	Moderate: flooding, large stones.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
9----------------- Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10---------------- Cleora	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, low strength.
11---------------- Elsah	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
12---------------- Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
13---------------- Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
14---------------- Enders	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
15*:					
Enders	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Leesburg	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
16*:					
Enders	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
17 Healing	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.
18 Johnsburg	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.
19 Leadvale	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.
20 Leesburg	Slight	Slight	Slight	Moderate: slope.	Slight.
21 Leesburg	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
22 Leesburg	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
23 Linker	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
24 Mayes	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.
25 Moko	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
26 Mountainburg	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
27 Mountainburg	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.
28 Mountainburg	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
29 Nella	Slight	Slight	Slight	Moderate: slope.	Slight.
30 Nella	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
31 Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
32 Nella	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.
33*, 34*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Steprock	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mountainburg	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
35 Nixa	Slight	Slight	Slight	Moderate: slope.	Slight.
36 Nixa	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
37 Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
38, 39 Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
40 Peridge	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.
41 Peridge	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.
42 Secesh	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
43 Steprock	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight.
44 Steprock	Moderate: depth to rock, large stones.	Moderate: large stones.	Moderate: depth to rock, large stones.	Moderate: slope, large stones.	Moderate: large stones.
45 Summit Variant	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
46 Summit Variant	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell, slope.
47 Tonti	Severe: wetness.	Moderate: wetness.	Severe: shrink-swell, wetness.	Moderate: slope, wetness.	Moderate: wetness.
48 Waben	Slight	Slight	Slight	Moderate: slope.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1 Allen	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
2 Arkana	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
3*:					
Arkana	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Moko	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, thin layer.
4*:					
Arkana	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
5 Britwater	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
6 Captina	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: too clayey, small stones, wetness.
7 Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones, seepage.
8 Ceda	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: large stones, seepage.
9 Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: small stones, slope.
10 Cleora	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Fair: too sandy.
11 Elsah	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12 Enders	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
13 Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
14 Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
15*:					
Enders	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Leesburg	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: small stones.
16*:					
Enders	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Leesburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
17 Healing	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
18 Johnsburg	Severe: wetness, percs slowly.	Moderate: slope.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness.
19 Leadvale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: area reclaim, too clayey.
20 Leesburg	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: small stones.
21 Leesburg	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: small stones.
22 Leesburg	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: small stones.
23 Linker	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
24 Mayes	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
25 Moko	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
26 Mountainburg	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: area reclaim, seepage, small stones.
27 Mountainburg	Severe: depth to rock, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones, thin layer.
28 Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
29 Nella	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey, large stones.	Slight	Poor: small stones.
30 Nella	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
31 Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
32 Nella	Moderate: percs slowly, slope, large stones.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
33*, 34*:					
Nella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Steprock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope, small stones.
Mountainburg	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
35 Nixa	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
36 Nixa	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Poor: small stones.
37 Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
38, 39 Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
40, 41 Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
42 Secesh	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
43 Steprock	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones, thin layer.
44 Steprock	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer, small stones.
45 Summit Variant	Severe: wetness, percs slowly.	Severe: wetness, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness, slope.	Poor: too clayey, hard to pack.
46 Summit Variant	Severe: wetness, percs slowly, slope.	Severe: wetness, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, wetness, slope.	Poor: too clayey, hard to pack, slope.
47 Tonti	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Moderate: wetness.	Poor: hard to pack, too clayey.
48 Waben	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1 Allen	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
2 Arkana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
3*:				
Arkana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Moko	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
4*:				
Arkana	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
5 Britwater	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
6 Captina	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, area reclaim.
7 Ceda	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
8 Ceda	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
9 Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
10 Cleora	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
11 Elsah	Good	Improbable: small stones.	Probable	Poor: area reclaim.
12, 13, 14 Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
15*:				
Enders	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Leesburg	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
16*:				
Enders	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, thin layer.
Leesburg	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
17 Healing	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
18 Johnsburg	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
19 Leadvale	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
20, 21 Leesburg	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
22 Leesburg	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
23 Linker	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
24 Mayes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
25 Moko	Poor: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
26 Mountainburg	Poor: thin layer, area reclaim.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
27 Mountainburg	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, thin layer.
28 Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
29, 30 Nella	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
31 Nella	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
32 Nella	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
33*, 34*:				
Nella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Steprock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Mountainburg	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
35, 36 Nixa	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
37 Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
38 Noark	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
39 Noark	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
40, 41 Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
42 Secesh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
43, 44 Steprock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
45, 46 Summit Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
47 Tonti	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
48 Waben	Good	Improbable: small stones.	Probable	Poor: small stones, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1 Allen	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
2 Arkana	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
3*:						
Arkana	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
4*:						
Arkana	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
5 Britwater	Moderate: seepage.	Slight	Deep to water	Slope	Favorable	Favorable.
6 Captina	Slight	Moderate: piping, wetness.	Deep to water	Wetness, erodes easily.	Erodes easily, rooting depth, percs slowly.	Erodes easily, rooting depth, percs slowly.
7 Ceda	Severe: seepage.	Severe: seepage.	Deep to water	Flooding, droughty.	Large stones	Droughty, large stones.
8 Ceda	Severe: seepage.	Severe: seepage.	Deep to water	Flooding, droughty, large stones.	Large stones	Droughty, large stones.
9 Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
10 Cleora	Severe: seepage.	Severe: seepage, piping.	Deep to water	Flooding	Favorable	Favorable.
11 Elsah	Severe: seepage.	Severe: seepage.	Deep to water	Flooding	Favorable	Favorable.
12 Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
13 Enders	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
14 Enders	Moderate: depth to rock.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
15*:						
Enders-----------	Moderate: depth to rock.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Leesburg---------	Moderate: seepage.	Moderate: piping, large stones.	Deep to water	Slope----------	Large stones, slope.	Slope.
16*:						
Enders-----------	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Leesburg---------	Severe: slope.	Moderate: piping, large stones.	Deep to water	Slope----------	Large stones, slope.	Slope.
17--------------- Healing	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
18--------------- Johnsburg	Moderate: seepage, depth to rock.	Severe: piping.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
19--------------- Leadvale	Moderate: seepage, depth to rock.	Severe: piping.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
20--------------- Leesburg	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Favorable------	Favorable.
21--------------- Leesburg	Moderate: seepage.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
22--------------- Leesburg	Moderate: seepage.	Moderate: piping, large stones.	Deep to water	Slope----------	Large stones, slope.	Slope.
23--------------- Linker	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
24--------------- Mayes	Slight---------	Severe: hard to pack.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
25--------------- Moko	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
26--------------- Mountainburg	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
27--------------- Mountainburg	Severe: depth to rock, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
28--------------- Mountainburg	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
29--------------- Nella	Moderate: seepage.	Severe: piping.	Deep to water	Droughty, slope.	Large stones---	Large stones, droughty.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
30, 31------------ Nella	Moderate: seepage.	Severe: piping.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
32---------------- Nella	Moderate: seepage.	Severe: piping.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
33*, 34*:						
Nella--------------	Severe: slope.	Severe: piping.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Steprock---------	Severe: slope.	Severe: piping.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Mountainburg-----	Severe: depth to rock, slope, seepage.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
35---------------- Nixa	Slight---------	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly, erodes easily.	Large stones, erodes easily, rooting depth.	Erodes easily, droughty, rooting depth.
36---------------- Nixa	Slight---------	Moderate: seepage, piping.	Deep to water	Droughty, percs slowly, erodes easily.	Slope, erodes easily, rooting depth.	Slope, erodes easily, droughty.
37, 38------------ Noark	Moderate: seepage.	Slight---------	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
39---------------- Noark	Severe: slope.	Slight---------	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
40---------------- Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
41---------------- Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
42---------------- Secesh	Severe: seepage.	Slight---------	Deep to water	Favorable------	Large stones---	Favorable.
43---------------- Steprock	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Slope, depth to rock, droughty.	Depth to rock, large stones.	Depth to rock, droughty.
44---------------- Steprock	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water	Droughty, depth to rock, slope.	Large stones, depth to rock.	Large stones, droughty, depth to rock.
45---------------- Summit Variant	Moderate: depth to rock.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly, wetness.
46---------------- Summit Variant	Moderate: depth to rock.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, slope.	Slope, large stones, erodes easily.	Large stones, wetness, slope.
47---------------- Tonti	Slight---------	Moderate: hard to pack, wetness, large stones.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Rooting depth, wetness, erodes easily.	Erodes easily, rooting depth, percs slowly.
48---------------- Waben	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Favorable------	Droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1 Allen	0-7	Loam	ML, CL-ML, SM, SM-SC	A-4	0-5	90-100	75-100	65-98	40-80	<26	NP-10
	7-39	Clay loam, loam	CL-ML, CL	A-4, A-6, A-7-6	0-10	85-100	75-100	65-98	50-80	20-43	4-19
	39-72	Clay loam, loam	CL-ML, CL, SC, SM-SC	A-4, A-6, A-7-6	0-10	85-100	70-98	60-95	45-80	21-48	5-22
2 Arkana	0-7	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	60-90	50-80	45-70	15-40	<25	NP-15
	7-12	Very cherty silty clay, very cherty clay, cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	12-32	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	32-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
3*, 4*: Arkana	0-7	Very cherty silt loam.	SM, SC, SM-SC, GM	A-4, A-2, A-1, A-6	20-30	60-90	50-80	45-70	15-40	<25	NP-15
	7-12	Very cherty silty clay, very cherty clay, cherty clay.	GC, SC, CL, CH	A-2, A-7	15-30	60-90	45-80	40-70	25-55	40-65	20-35
	12-32	Clay, cherty clay	CH	A-7	0-10	70-100	70-100	65-95	60-85	51-80	31-50
	32-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moko	0-10	Very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5 Britwater	0-7	Gravelly silt loam.	ML, CL, CL-ML	A-4	0	70-85	55-75	55-70	50-60	<30	NP-10
	7-36	Gravelly silty clay loam, gravelly silt loam.	CL, GC, SC	A-2, A-6, A-4	0	60-95	55-95	45-80	30-65	25-40	8-30
	36-72	Very gravelly silty clay loam, gravelly silty clay loam, very gravelly silty clay.	GC, SC	A-2, A-6, A-7	0	50-80	40-75	30-65	15-40	25-55	8-30
6 Captina	0-7	Silt loam	ML, CL-ML	A-4	0	95-100	92-100	85-100	75-90	<30	NP-7
	7-20	Silt loam, silty clay loam.	ML, CL-ML, CL	A-4, A-6	0	95-100	92-100	85-100	80-95	20-40	5-15
	20-38	Silt loam, silty clay loam, cherty silt loam.	GC, CL-ML, CL	A-2, A-4, A-6	0-5	75-100	50-100	40-100	35-95	20-40	5-20
	38-52	Silt loam, cherty silty clay loam, very cherty silty clay loam.	GC, CL, CL-ML	A-2, A-4, A-6	0-15	50-100	25-100	20-100	20-95	20-40	7-20
	52-72	Very cherty clay, very cherty silty clay, extremely cherty clay.	GC, GP-GC	A-2	5-30	30-50	10-50	10-40	5-30	40-60	25-45

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
7 Ceda	0-15	Gravelly fine sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2, A-4	0-10	35-75	35-75	30-50	13-45	<26	NP-7
	15-72	Very gravelly loam, very gravelly fine sandy loam, cobbly clay loam.	GM, GP-GM, GM-GC	A-1, A-2, A-4, A-6	0-30	15-50	15-50	10-50	5-45	<40	NP-18
8 Ceda	0-15	Cobbly fine sandy loam.	SM, GM, ML, GM-GC	A-1, A-2, A-4	5-25	35-75	35-75	35-65	20-65	22-29	2-7
	15-72	Cobbly loam, very cobbly loam, gravelly fine sandy loam.	GM, GP-GM, GM-GC, GC	A-1, A-2, A-4, A-6	5-30	15-50	15-50	10-50	5-45	<40	NP-18
9 Clarksville	0-14	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2, A-1	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	14-58	Extremely cherty silty clay loam, extremely cherty silt loam.	GC, SC, SP-SC, GP-GC	A-2, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	58-72	Extremely cherty silty clay loam, extremely cherty clay.	GC, SC, GP-GC, SP-SC	A-7, A-6, A-2	5-20	30-70	10-60	10-50	10-45	35-75	20-55
10 Cleora	0-21	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<31	NP-10
	21-51	Loam, fine sandy loam.	SM, SC, ML, CL	A-4	0	100	98-100	94-100	36-85	<31	NP-10
	51-79	Loam, fine sandy loam, loamy fine sand.	SM, SC, ML, CL	A-2, A-4	0	100	98-100	90-100	15-85	<31	NP-10
11 Elsah	0-6	Very cherty silt loam.	SM, SC, ML, CL	A-1, A-2, A-4	5-25	50-90	30-70	30-70	20-65	<30	NP-8
	6-70	Very cherty loam, very cherty silt loam, extremely cherty silt loam.	GM, GP-GM	A-1	5-25	20-65	20-60	20-40	10-25	<30	NP-6
12, 13 Enders	0-6	Gravelly loam	ML, SM, SM-SC, CL-ML	A-2, A-4	0-5	50-95	50-75	30-70	30-60	20-35	2-10
	6-10	Gravelly clay loam, gravelly loam.	CL, SC	A-6, A-4	0	70-95	50-75	50-70	45-60	20-35	6-17
	10-52	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	65-80	35-45
	52-58	Shaly clay, shaly silty clay, very shaly silty clay.	CH	A-7	0-15	95-100	90-100	85-100	70-95	65-80	35-45
	58-84	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14---------------- Enders	0-6	Stony loam--------	SM, ML, SM-SC, CL-ML	A-4, A-2	20-40	80-90	70-80	65-75	30-60	20-35	2-10
	6-10	Gravelly clay loam, gravelly loam.	CL, SC	A-6, A-4	20-40	70-95	50-75	50-70	45-60	20-35	6-17
	10-52	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	52-58	Shaly clay, shaly silty clay, very shaly silty clay.	CH	A-7	0-15	95-100	85-100	85-100	70-95	50-65	30-40
	58-84	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
15*, 16*: Enders-----------	0-6	Stony loam--------	SM, ML, SM-SC CL-ML	A-4, A-2	20-40	80-90	70-80	65-75	30-60	20-35	2-10
	6-10	Gravelly clay loam, gravelly loam.	CL, SC	A-6, A-4	20-40	70-95	50-75	50-70	45-60	20-35	6-17
	10-52	Silty clay, clay	CH	A-7	0	95-100	85-100	85-100	70-95	50-65	30-40
	52-58	Shaly clay, shaly silty clay, very shaly silty clay.	CH	A-7	0-15	95-100	85-100	85-100	70-95	50-65	30-40
	58-84	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Leesburg---------	0-7	Stony loam--------	SM, SM-SC, ML, CL-ML	A-2, A-4	10-25	85-95	80-90	45-70	25-55	<25	NP-7
	7-11	Gravelly loam, stony loam.	SM, ML, CL-ML, CL	A-4	0-15	65-85	55-80	45-70	40-60	<30	NP-10
	11-38	Gravelly clay loam, gravelly loam, stony loam.	SC, CL	A-4, A-6	0-20	75-90	70-85	55-75	40-65	26-40	8-20
	38-72	Gravelly clay, very gravelly silty clay, shaly clay.	SC, CL	A-6, A-7	0-15	75-90	55-85	50-75	40-70	35-50	12-25
17---------------- Healing	0-10	Silt loam---------	ML, CL-ML	A-4	0	90-100	90-100	90-100	80-95	<30	NP-7
	10-70	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	90-100	90-100	90-100	85-95	20-35	5-15
	70-85	Loam, clay loam, gravelly silt loam.	GC, ML, CL, SC	A-4, A-6, A-2	0	60-100	50-100	35-85	25-80	27-40	4-17
	85-95	Sandy loam, loamy sand, very gravelly sandy loam.	ML, CL-ML, SM, GM	A-2, A-4	0	75-95	45-95	35-85	25-80	<30	NP-10
18---------------- Johnsburg	0-7	Silt loam---------	CL, ML	A-4, A-6	0	100	100	90-100	70-95	30-40	5-15
	7-22	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	22-34	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-95	85-95	60-85	20-35	5-15
	34-72	Silty clay loam, silty clay.	CL, SC, CL-ML, SM-SC	A-4, A-6	0-10	90-95	85-90	60-90	35-70	20-30	5-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
19---------------- Leadvale	0-8	Loam--------------	ML, CL-ML, CL	A-4	0	100	95-100	85-95	65-85	18-32	2-10
	8-19	Loam, silty clay loam, clay loam.	CL-ML, CL, ML	A-4, A-6	0	100	95-100	90-98	75-90	22-36	3-14
	19-47	Clay loam, silty clay loam, loam.	CL-ML, CL, ML	A-4, A-6, A-7	0	100	95-100	80-98	70-90	23-42	3-18
	47-78	Clay loam, silty clay, clay.	CL, MH, ML, CH	A-6, A-7	0-5	90-100	90-100	85-95	70-90	32-58	12-26
20, 21------------ Leesburg	0-7	Gravelly loam----	SM, GM, ML	A-2, A-4, A-1	0-15	60-85	55-80	40-65	15-55	<20	NP
	7-11	Gravelly loam----	SM, ML, CL-ML, CL	A-4	0-15	65-85	=5-80	45-70	40-60	<30	NP-10
	11-38	Gravelly clay loam, gravelly loam.	SC, CL	A-4, A-6	0-20	75-90	70-85	55-75	40-65	26-40	8-20
	38-72	Gravelly clay, very gravelly silty clay, shaly clay.	SC, CL	A-6, A-7	0-15	75-90	55-85	50-75	40-70	35-50	12-25
22---------------- Leesburg	0-7	Stony loam-------	SM, SM-SC, ML, CL-ML	A-2, A-4	10-25	85-95	80-90	45-70	25-55	<25	NP-7
	7-11	Gravelly loam, stony loam.	SM, ML, CL-ML, CL	A-4	0-15	65-85	55-80	45-70	40-60	<30	NP-10
	11-38	Gravelly clay loam, gravelly loam, stony loam.	SC, CL	A-4, A-6	0-20	75-90	70-85	55-75	40-65	26-40	8-20
	38-72	Gravelly clay, very gravelly silty clay, shaly clay.	SC, CL	A-6, A-7	0-15	75-90	55-85	50-75	40-70	35-50	12-25
23----------------	0-7	Loam--------------	SM, ML, CL-ML, SC-SM	A-4	0	85-100	80-100	70-100	40-70	<30	NP-7
Linker	7-33	Sandy clay loam, loam, clay loam.	CL, SC, SM, ML	A-4, A-6	0-10	90-100	85-100	70-100	40-80	<40	NP-18
	33-38	Gravelly loam, gravelly fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4	0-10	65-100	60-75	55-70	30-60	<30	NP-7
	38-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24---------------- Mayes	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	98-100	80-98	37-50	15-25
	10-72	Clay, silty clay, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	98-100	96-100	80-99	37-65	15-38
25---------------- Moko	0-10	Very stony silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	35-75	65-90	50-72	45-70	40-60	16-38	3-15
	10-12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
26---------------- Mountainburg	0-5	Gravelly loam----	GM, SM	A-1, A-2	0-15	60-80	50-70	20-40	15-30	---	NP
	5-18	Very gravelly sandy clay loam, very gravelly loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	15-30	40-60	30-50	25-50	10-25	<30	NP-10
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27--------------- Mountainburg	0-5	Stony loam-------	GM	A-1, A-2	15-40	40-55	35-55	30-50	20-25	<20	NP
	5-18	Very gravelly loam, very stony loam, very stony sandy clay loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-60	30-50	25-50	20-30	<30	NP-10
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28--------------- Mountainburg	0-5	Very stony sandy loam.	GM	A-1, A-2	30-65	40-80	45-70	25-50	15-25	<20	NP
	5-18	Very gravelly loam, very stony loam, very stony sandy clay loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-80	40-80	25-50	20-30	<30	NP-10
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
29, 30, 31------- Nella	0-12	Gravelly loam----	ML, CL, GM, SM	A-4, A-2	0-10	65-90	45-80	40-65	30-55	<30	NP-8
	12-72	Cobbly clay loam, gravelly clay loam, cobbly loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	75-90	45-70	30-60	25-40	6-20
32--------------- Nella	0-1	Stony loam-------	ML, CL, SM, SC	A-4	10-30	90-100	85-90	65-75	36-55	<30	NP-8
	1-72	Stony clay loam, cobbly loam, cobbly clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
33*, 34*:											
Nella-----------	0-1	Very stony loam	SM, SM-SC, SC, CL-ML	A-4, A-2	15-45	85-95	80-90	55-75	30-55	<30	NP-8
	1-72	Stony clay loam, cobbly loam, cobbly clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-6, A-2	0-30	75-95	60-90	45-70	30-60	25-40	6-20
Steprock---------	0-7	Very stony loam	SM, SM-SC, ML, CL-ML	A-2, A-4	15-45	70-90	45-85	40-80	30-65	<20	NP-5
	7-36	Very gravelly clay loam, very gravelly loam, very stony clay loam.	SM, GM, ML, CL-ML	A-2, A-4	5-35	45-80	30-70	30-65	30-65	<25	NP-7
	36-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mountainburg----	0-1	Very stony loam	GM	A-1, A-2	30-65	40-80	45-70	25-50	15-25	<20	NP
	1-18	Very gravelly loam, very stony loam, very stony sandy clay loam.	GM, GC, GM-GC	A-1, A-2	30-65	40-80	40-80	25-50	20-30	<30	NP-10
	18-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
35, 36----------- Nixa	0-7	Very cherty silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-10	30-70	20-60	20-55	20-50	<25	NP-8
	7-18	Very cherty silt loam, extremely cherty silt loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	30-70	20-60	20-55	20-50	<30	NP-8
	18-31	Very cherty silt loam, very cherty silty clay loam, extremely cherty silt loam.	GC, GM, SC, SM	A-1, A-2, A-4	0-10	40-70	30-60	25-55	20-50	<30	NP-8
	31-72	Very cherty silty clay, very cherty clay, extremely cherty clay.	GM, GC, GP-GM, GM-GC	A-1, A-2	10-30	15-45	10-40	10-35	10-30	<30	NP-8
37, 38, 39------- Noark	0-11	Very cherty silt loam.	GM	A-2, A-1, A-4	0-10	20-50	20-50	20-50	15-45	<20	NP-3
	11-17	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0-10	20-50	20-50	20-50	15-45	20-35	5-15
	17-27	Very cherty clay, silty clay.	GC	A-2, A-7	5-10	20-50	20-50	20-50	15-45	41-60	20-35
	27-72	Very cherty clay, very cherty silty clay, extremely cherty clay.	GC, GP-GC,	A-2	5-10	10-40	10-40	10-40	5-35	41-60	20-35
40, 41----------- Peridge	0-7	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-90	80-85	<20	NP-5
	7-28	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	80-95	30-40	11-20
	28-50	Gravelly silty clay loam, silty clay loam.	CL, SC, GC	A-6	0	55-100	55-100	45-90	40-85	30-40	11-20
	50-72	Silty clay, gravelly silty clay, silty clay loam.	CL, SC, GC	A-7, A-6	0	55-100	55-100	45-90	40-85	35-50	15-25
42--------------- Secesh	0-10	Gravelly silt loam.	ML, SM, CL-ML	A-4	0-5	85-90	45-75	45-75	40-70	20-30	NP-7
	10-49	Gravelly silty clay loam, gravelly silt loam.	CL, CL-ML, SC	A-4, A-6	0-5	80-90	45-75	45-75	40-70	25-35	5-12
	49-72	Gravelly silty clay loam, very gravelly silty clay loam, very gravelly silt loam.	CL, GC, SC	A-6	0-10	40-70	25-70	25-65	20-60	30-40	11-20
43--------------- Steprock	0-7	Gravelly loam----	SM, ML, SM-SC, CL-ML	A-2, A-4	0-10	70-90	45-75	40-70	30-65	<20	NP-5
	7-36	Very gravelly clay loam, very gravelly loam.	GM, SM, ML, CL-ML	A-4	5-35	45-80	40-70	40-65	35-65	<24	NP-7
	36-40	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
44--------------- Steprock	0-7	Stony loam-------	SM, SM-SC, ML, CL-ML	A-2, A-4	10-30	70-90	60-85	55-85	30-65	<20	NP-5
	7-36	Very gravelly clay loam, very gravelly loam, very stony clay loam.	SM, GM, ML, CL-ML	A-2, A-4	5-25	45-80	40-70	40-65	30-65	<25	NP-7
	36-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
45--------------- Summit Variant	0-10	Silty clay loam	CL	A-6, A-7	0	85-100	80-100	55-95	50-90	35-50	11-30
	10-56	Clay, silty clay	CH, CL	A-7	0	90-100	85-100	80-100	80-95	41-70	18-40
	56-82	Weathered bedrock	---	---	---	---	---	---	---	---	---
46--------------- Summit Variant	0-10	Stony silty clay loam.	CL	A-6, A-7	10-25	85-95	80-90	75-85	50-80	35-50	11-30
	10-56	Clay, silty clay	CH, CL	A-7	0	90-100	85-100	80-100	80-95	41-70	18-40
	56-82	Weathered bedrock	---	---	---	---	---	---	---	---	---
47--------------- Tonti	0-7	Cherty silt loam	ML	A-4	0-5	75-95	70-90	65-85	60-70	<20	NP-3
	7-20	Cherty silty clay loam, cherty silt loam.	CL-ML, CL	A-4, A-6	0-5	70-90	65-85	60-80	55-75	16-30	5-15
	20-34	Very cherty silty clay loam, very cherty silt loam, cherty silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	5-35	50-75	45-70	40-65	40-60	16-30	5-15
	34-72	Very cherty silty clay, very cherty clay, extremely cherty clay.	CL, CH	A-2, A-6, A-7	5-20	30-60	20-50	15-45	15-40	30-55	15-30
48--------------- Waben	0-13	Very cherty silt loam.	GM, GM-GC, GP-GM	A-1, A-2	0-10	20-53	15-50	10-40	5-35	<30	NP-7
	13-72	Very cherty silt loam, cherty silty clay loam, extremely cherty silt loam.	GM, GC, GP-GM, GM-GC	A-1, A-2	0-10	20-53	15-50	10-40	5-35	20-40	3-20

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* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
1	0-7	7-25	1.30-1.50	0.6-2.0	0.14-0.19	4.5-5.5	Low	0.28	5	.5-3
Allen	7-39	18-35	1.40-1.60	0.6-2.0	0.12-0.17	4.5-5.5	Low	0.20		
	39-72	20-40	1.40-1.60	0.6-2.0	0.10-0.17	4.5-5.5	Low	0.20		
2	0-7	15-27	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low	0.24	2	2-4
Arkana	7-12	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate	0.24		
	12-32	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High	0.32		
	32-40	---	---	---	---	---	-------------	----		
3*, 4*:										
Arkana	0-7	15-27	1.25-1.50	0.6-2.0	0.08-0.12	5.6-7.8	Low	0.24	2	2-4
	7-12	50-85	1.20-1.45	0.06-0.2	0.06-0.10	5.1-8.4	Moderate	0.24		
	12-32	60-85	1.15-1.45	<0.06	0.12-0.18	5.1-8.4	High	0.32		
	32-40	---	---	---	---	---	-------------	----		
Moko	0-10	18-27	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.24	1	2-4
	10-12	---	---	---	---	---	-------------	----		
5	0-7	15-25	1.40-1.60	0.6-2.0	0.12-0.20	5.1-6.0	Low	0.32	3	.5-1
Britwater	7-36	18-34	1.40-1.60	0.6-2.0	0.12-0.15	5.1-6.0	Low	0.28		
	36-72	18-45	1.50-1.70	0.6-2.0	0.09-0.11	5.1-6.0	Low	0.28		
6	0-7	8-20	1.50-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low	0.43	5	1-3
Captina	7-20	20-35	1.40-1.50	0.6-2.0	0.18-0.22	3.6-6.0	Low	0.43		
	20-38	20-35	1.45-1.55	0.06-0.2	0.08-0.12	3.6-6.0	Low	0.37		
	38-52	20-35	1.45-1.55	0.06-0.2	0.05-0.12	3.6-6.0	Low	0.32		
	52-72	35-65	1.25-1.45	0.2-0.6	0.01-0.14	3.6-6.0	Moderate	0.32		
7	0-15	10-18	1.30-1.60	6.0-20	0.05-0.12	5.6-6.5	Low	0.17	5	.5-1
Ceda	15-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low	0.28		
8	0-15	10-18	1.30-1.55	6.0-20	0.07-0.17	5.6-6.5	Low	0.28	5	.5-1
Ceda	15-72	15-32	1.40-1.70	6.0-20	0.02-0.16	5.6-6.5	Low	0.28		
9	0-14	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low	0.28	2	1-2
Clarksville	14-58	25-35	1.40-1.65	2.0-6.0	0.06-0.10	4.5-5.5	Low	0.28		
	58-72	35-75	1.40-1.80	0.6-2.0	0.05-0.08	4.5-5.5	Low	0.28		
10	0-21	10-18	1.30-1.55	2.0-6.0	0.11-0.20	5.6-7.3	Low	0.32	5	2-4
Cleora	21-51	10-18	1.40-1.70	2.0-6.0	0.11-0.20	5.6-7.3	Low	0.32		
	51-79	5-18	1.40-1.70	2.0-6.0	0.07-0.20	5.6-7.3	Low	0.32		
11	0-6	10-25	1.40-1.60	2.0-6.0	0.08-0.17	5.6-7.3	Low	0.28	3	1-2
Elsah	6-70	5-15	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low	0.17		
12, 13	0-6	10-25	1.25-1.60	0.6-2.0	0.07-0.15	3.6-5.5	Low	0.32	3	.5-2
Enders	6-10	15-35	1.25-1.60	0.2-0.6	0.15-0.22	3.6-5.5	Low	0.43		
	10-52	35-60	1.15-1.45	<0.06	0.12-0.18	3.6-5.5	High	0.37		
	52-58	35-60	1.20-1.45	<0.06	0.08-0.10	3.6-5.5	Moderate	0.37		
	58-84	---	---	---	---	---	-------------	----		
14	0-6	10-25	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low	0.32	3	.5-2
Enders	6-10	15-35	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low	0.28		
	10-52	35-60	1.15-1.45	<0.06	0.09-0.13	3.6-5.5	High	0.24		
	52-58	35-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate	0.24		
	58-84	---	---	---	---	---	-------------	----		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
15*, 16*:										
Enders	0-6	10-25	1.25-1.60	0.6-2.0	0.15-0.22	3.6-5.5	Low	0.32	3	.5-2
	6-10	15-35	1.25-1.45	0.2-0.6	0.15-0.20	3.6-5.5	Low	0.28		
	10-52	35-60	1.15-1.45	<0.06	0.09-0.13	3.6-5.5	High	0.24		
	52-58	35-60	1.25-1.45	<0.06	0.11-0.13	3.6-5.5	Moderate	0.24		
	58-84	---	---	---	---	---	-------------	----		
Leesburg	0-7	5-18	1.30-1.50	2.0-6.0	0.08-0.16	4.5-6.0	Low	0.15	5	1-3
	7-11	18-30	1.35-1.55	0.6-2.0	0.09-0.18	4.5-5.5	Low	0.32		
	11-38	20-40	1.35-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low	0.32		
	38-72	40-50	1.25-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	0.32		
17	0-10	10-25	1.25-1.50	0.6-2.0	0.16-0.24	5.0-6.0	Low	0.37	5	2-4
Healing	10-70	20-35	1.25-1.45	0.6-2.0	0.16-0.24	5.0-6.0	Low	0.37		
	70-85	20-35	1.25-1.60	0.6-2.0	0.13-0.19	4.5-6.0	Low	0.37		
	85-95	5-15	1.20-1.40	0.6-6.0	0.06-0.13	4.5-6.0	Low	0.24		
18	0-7	12-20	1.30-1.45	0.6-2.0	0.20-0.24	4.5-6.5	Low	0.43	3	1-2
Johnsburg	7-22	24-32	1.40-1.55	0.6-2.0	0.18-0.22	3.6-5.5	Moderate	0.43		
	22-34	22-30	1.60-1.80	<0.06	0.06-0.08	3.6-5.5	Low	0.43		
	34-72	27-45	1.40-1.55	0.6-2.0	0.12-0.14	3.6-5.5	Low	0.43		
19	0-8	12-22	1.30-1.40	0.6-2.0	0.17-0.22	4.5-5.5	Low	0.43	3	.5-3
Leadvale	8-19	20-32	1.30-1.50	0.6-2.0	0.17-0.20	4.5-5.5	Low	0.43		
	19-47	20-35	1.55-1.70	0.06-0.6	0.06-0.11	4.5-5.5	Low	0.43		
	47-78	30-45	1.40-1.60	0.06-0.6	0.06-0.11	4.5-5.5	Low	0.24		
20, 21	0-6	5-18	1.30-1.50	2.0-6.0	0.08-0.16	4.5-6.0	Low	0.15	5	1-2
Leesburg	6-11	18-30	1.35-1.55	0.6-2.0	0.09-0.18	4.5-5.5	Low	0.32		
	11-38	20-40	1.35-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low	0.32		
	38-72	40-50	1.25-1.60	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	0.32		
22	0-7	5-18	1.30-1.50	2.0-6.0	0.08-0.16	4.5-6.0	Low	0.15	5	1-3
Leesburg	7-11	18-30	1.35-1.55	0.6-2.0	0.09-0.18	4.5-5.5	Low	0.32		
	11-38	20-40	1.35-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Low	0.32		
	38-72	40-50	1.25-1.60	0.6-2.0	0.12-0.18	4.5-5.5	Moderate	0.32		
23	0-7	5-20	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low	0.28	3	.5-3
Linker	7-33	18-35	1.30-1.60	0.6-2.0	0.11-0.20	3.6-5.5	Low	0.32		
	33-38	18-27	1.30-1.60	0.6-2.0	0.08-0.14	3.6-5.5	Low	0.28		
	38-40	---	---	---	---	---	-------------	----		
24	0-10	27-35	1.30-1.60	0.2-0.6	0.15-0.22	5.1-7.3	Moderate	0.43	5	1-3
Mayes	10-72	35-50	1.35-1.65	<0.06	0.12-0.22	5.6-7.8	High	0.43		
25	0-10	18-27	1.25-1.60	0.6-2.0	0.09-0.14	6.6-7.8	Low	0.24	1	2-4
Moko	10-12	---	---	---	---	---	-------------	----		
26	0-5	3-10	1.40-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.20	1	.5-1
Mountainburg	5-18	15-25	1.50-1.70	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.17		
	18-20	---	---	---	---	---	-------------	----		
27	0-5	4-12	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.17	1	1-2
Mountainburg	5-18	10-18	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	18-20	---	---	---	---	---	-------------	----		
28	0-5	3-10	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low	0.15	1	1-2
Mountainburg	5-18	10-18	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low	0.24		
	18-20	---	---	---	---	---	-------------	----		
29, 30, 31	0-12	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low	0.15	5	.5-3
Nella	12-72	22-35	1.35-1.55	0.6-2.0	0.08-0.15	4.5-5.5	Low	0.15		
32	0-1	12-25	1.30-1.45	2.0-6.0	0.08-0.15	4.5-5.5	Low	0.15	5	.5-3
Nella	1-72	22-35	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.15		
33*, 34*:										
Nella	0-1	12-25	1.30-1.45	2.0-6.0	0.06-0.14	4.5-5.5	Low	0.15	5	.5-3
	1-72	22-35	1.35-1.55	0.6-2.0	0.07-0.14	4.5-5.5	Low	0.15		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
33*, 34*:										
Steprock--------	0-7	8-18	1.30-1.60	2.0-6.0	0.04-0.08	4.5-5.5	Low-----------	0.17	3	.5-2
	7-36	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low-----------	0.17		
	36-40	---	---	---	---	---	-------------	----		
Mountainburg----	0-1	3-10	1.30-1.60	2.0-6.0	0.05-0.10	4.5-6.0	Low-----------	0.17	1	1-2
	1-18	10-18	1.30-1.60	2.0-6.0	0.05-0.10	4.5-5.5	Low-----------	0.24		
	18-20	---	---	---	---	---	-------------	----		
35, 36----------- Nixa	0-7	5-25	1.30-1.60	0.6-2.0	0.08-0.10	4.5-5.5	Low-----------	0.32	2	1-3
	7-18	20-27	1.30-1.60	0.2-0.6	0.08-0.10	4.5-5.5	Low-----------	0.32		
	18-31	20-35	1.40-1.80	<0.06	0.05-0.08	4.5-5.5	Low-----------	0.32		
	31-72	40-50	1.30-1.45	0.2-.06	0.03-0.06	4.5-5.5	Low-----------	0.37		
37, 38, 39------- Noark	0-11	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low-----------	0.28	3	1-3
	11-17	30-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low-----------	0.28		
	17-27	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low-----------	0.24		
	27-72	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low-----------	0.24		
40, 41----------- Peridge	0-7	10-20	1.25-1.45	0.6-2.0	0.16-0.24	4.5-6.0	Low-----------	0.37	5	1-3
	7-28	20-34	1.25-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.32		
	28-50	30-40	1.25-1.40	0.6-2.0	0.13-0.22	4.5-6.0	Low-----------	0.28		
	50-72	40-60	1.15-1.35	0.6-2.0	0.09-0.18	4.5-6.0	Moderate-----	0.24		
42--------------- Secesh	0-10	15-25	1.10-1.30	0.6-2.0	0.16-0.20	5.1-6.5	Low-----------	0.32	3	.5-2
	10-49	20-30	1.20-1.40	0.6-2.0	0.13-0.19	4.5-6.0	Low-----------	0.32		
	49-72	25-35	1.20-1.40	0.6-2.0	0.09-0.14	4.5-6.0	Low-----------	0.32		
43--------------- Steprock	0-7	8-18	1.30-1.60	2.0-6.0	0.08-0.15	4.5-5.5	Low-----------	0.20	3	.5-2
	7-36	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low-----------	0.17		
	36-40	---	---	---	---	---	-------------	----		
44--------------- Steprock	0-7	8-18	1.30-1.60	2.0-6.0	0.08-0.12	4.5-5.5	Low-----------	0.20	3	.5-2
	7-36	10-35	1.30-1.60	0.6-2.0	0.06-0.10	4.5-5.5	Low-----------	0.17		
	36-40	---	---	---	---	---	-------------	----		
45--------------- Summit Variant	0-10	27-40	1.25-1.50	0.2-0.6	0.16-0.20	5.6-7.3	Moderate-----	0.43	3	2-4
	10-56	40-60	1.35-1.60	<0.06	0.10-0.18	6.1-8.4	High----------	0.32		
	56-82	---	---	---	---	---	-------------	----		
46--------------- Summit Variant	0-10	27-40	1.25-1.50	0.2-0.6	0.12-0.16	5.6-7.3	Moderate-----	0.37	3	2-4
	10-56	40-60	1.35-1.60	<0.06	0.10-0.18	6.1-8.4	High----------	0.32		
	56-82	---	---	---	---	---	-------------	----		
47--------------- Tonti	0-7	10-25	1.30-1.50	0.6-2.0	0.15-0.20	4.5-5.5	Low-----------	0.37	4	1-2
	7-20	22-32	1.30-1.50	0.6-2.0	0.12-0.18	4.5-5.5	Low-----------	0.32		
	20-34	18-35	1.40-1.60	0.06-0.2	0.02-0.08	4.5-5.5	Low-----------	0.28		
	34-72	40-55	1.20-1.40	0.06-0.2	0.05-0.10	4.5-5.5	High----------	0.32		
48--------------- Waben	0-13	10-25	1.40-1.60	2.0-6.0	0.05-0.15	5.1-6.5	Low-----------	0.28	5	1-2
	13-72	15-35	1.40-1.60	2.0-6.0	0.05-0.15	5.1-6.5	Low-----------	0.24		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
1----------------- Allen	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
2----------------- Arkana	C	None---------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
3*, 4*:											
Arkana------------	C	None---------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
Moko--------------	D	None---------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
5----------------- Britwater	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
6----------------- Captina	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	Moderate	High.
7----------------- Ceda	B	Occasional	Very brief	Dec-Jun	>6.0	---	---	>60	---	Low------	Moderate.
8----------------- Ceda	B	Frequent----	Very brief	Dec-Jun	>6.0	---	---	>60	---	Low------	Moderate.
9----------------- Clarksville	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High.
10---------------- Cleora	B	Occasional	Very brief	Dec-Jun	>6.0	---	---	>60	---	Low------	Moderate.
11---------------- Elsah	B	Occasional	Very brief	Dec-Jun	>6.0	---	---	>60	---	Low------	Moderate.
12, 13, 14-------- Enders	C	None---------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
15*, 16*:											
Enders------------	C	None---------	---	---	>6.0	---	---	40-60	Soft	High-----	High.
Leesburg----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
17---------------- Healing	B	Rare---------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
18---------------- Johnsburg	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	60-80	Soft	High-----	High.
19---------------- Leadvale	C	None---------	---	---	1.5-3.0	Perched	Jan-Apr	>60	Soft	Moderate	Moderate.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
20, 21, 22-------- Leesburg	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
23---------------- Linker	B	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
24---------------- Mayes	D	None--------	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	Moderate.
25---------------- Moko	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Low.
26---------------- Mountainburg	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	High.
27, 28------------ Mountainburg	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
29, 30, 31-------- Nella	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
32---------------- Nella	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
33*, 34*: Nella------------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.
Steprock----------	B	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High.
Mountainburg------	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	Moderate.
35, 36------------ Nixa	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
37, 38, 39-------- Noark	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High.
40, 41------------ Peridge	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
42---------------- Secesh	B	Occasional	Very brief	Dec-Jun	>6.0	---	---	>60	---	Low------	Moderate.
43, 44------------ Steprock	B	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	High.
45, 46------------ Summit Variant	C	None--------	---	---	2.0-3.0	Perched	Dec-Apr	40-60	Soft	High-----	Low.
47---------------- Tonti	C	None--------	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	High-----	High.

See footnote at end of table.

TABLE 15.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
48----------------- Waben	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL ANALYSES OF SELECTED SOILS

Soil name and sample number	Depth	Horizon	Particle-size distribution: Very coarse sand through medium sand (2.0-0.25 mm)	Fine sand (0.25-0.10 mm)	Very fine sand 0.10 mm) 0.05mm)	Total sand (2.0-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)
	In		--------------------Percent less	than 2.0 mm	--------------------			
Healing silt loam:								
S80-AR-087-1 (1-8)	0-10	A1	1	6	8	15	64	21
	10-21	Bt1*	0	5	8	13	57	30
	21-33	Bt1*	0	6	9	15	52	33
	33-45	Bt2*	1	5	9	15	52	33
	45-57	Bt2*	0	5	9	14	52	34
	57-70	Bt3	0	6	11	17	49	34
	70-85	Bt4	1	24	17	42	33	25
	85-95	C	42	14	8	64	22	14
Nella very stony loam:								
S80-AR-087-3 (1-7)	0-4	A**	17	24	10	51	40	9
	4-12	BE	16	24	7	47	35	18
	12-24	Bt1*	15	18	5	38	24	38
	24-36	Bt1*	16	19	6	41	24	35
	36-48	Bt2*	16	20	6	42	23	35
	48-60	Bt2*	18	21	6	45	20	35
	60-72	Bt2*	16	21	6	43	22	35

* The horizon was subdivided for sampling purposes.

** The A horizon and the E horizon were combined for sampling purposes.

TABLE 17.--CHEMICAL ANALYSES OF SELECTED SOILS

Soil name and sample number	Depth	Horizon	Extractable bases				Extractable acidity	Base saturation	Reaction 1:1 soil:water	Organic matter
			Ca	Mg	Na	K				
	In		Milliequivalents per 100 grams of soil					Pct	pH	Pct
Healing silt loam: S80-AR-087-1 (1-8)										
	0-10	A1	6.9	1.3	0.2	0.3	12.8	40	5.2	2.1
	10-21	Bt1*	8.4	1.0	0.1	0.2	13.2	42	5.5	1.2
	21-33	Bt1*	7.8	1.2	0.1	0.2	13.2	41	5.7	0.7
	33-45	Bt2*	7.7	1.9	0.0	0.3	12.2	45	5.8	0.6
	45-57	Bt2*	7.6	2.6	0.0	0.3	13.4	44	5.6	0.6
	57-70	Bt3	7.4	3.1	0.0	0.3	14.5	43	5.4	0.5
	70-85	Bt4	3.4	1.9	0.1	0.3	15.1	27	5.0	0.4
	85-95	C	2.7	1.4	0.0	0.3	9.0	33	5.2	0.4
Nella very stony loam: S80-AR-087-3 (1-7)										
	0-4	A**	0.3	0.4	0.0	0.2	11.9	7	4.9	2.2
	4-12	BE	0.2	0.4	0.0	0.2	12.1	6	4.7	1.3
	12-24	Bt1*	0.2	1.6	0.0	0.3	20.5	9	4.5	1.1
	24-36	Bt1*	0.1	0.9	0.1	0.2	18.2	7	4.5	0.4
	36-48	Bt2*	0.1	0.6	0.0	0.2	17.8	5	4.5	0.3
	48-60	Bt2*	0.2	0.5	0.0	0.2	18.6	5	4.5	0.2
	60-72	Bt2*	0.1	0.4	0.0	0.2	18.9	4	4.5	0.2

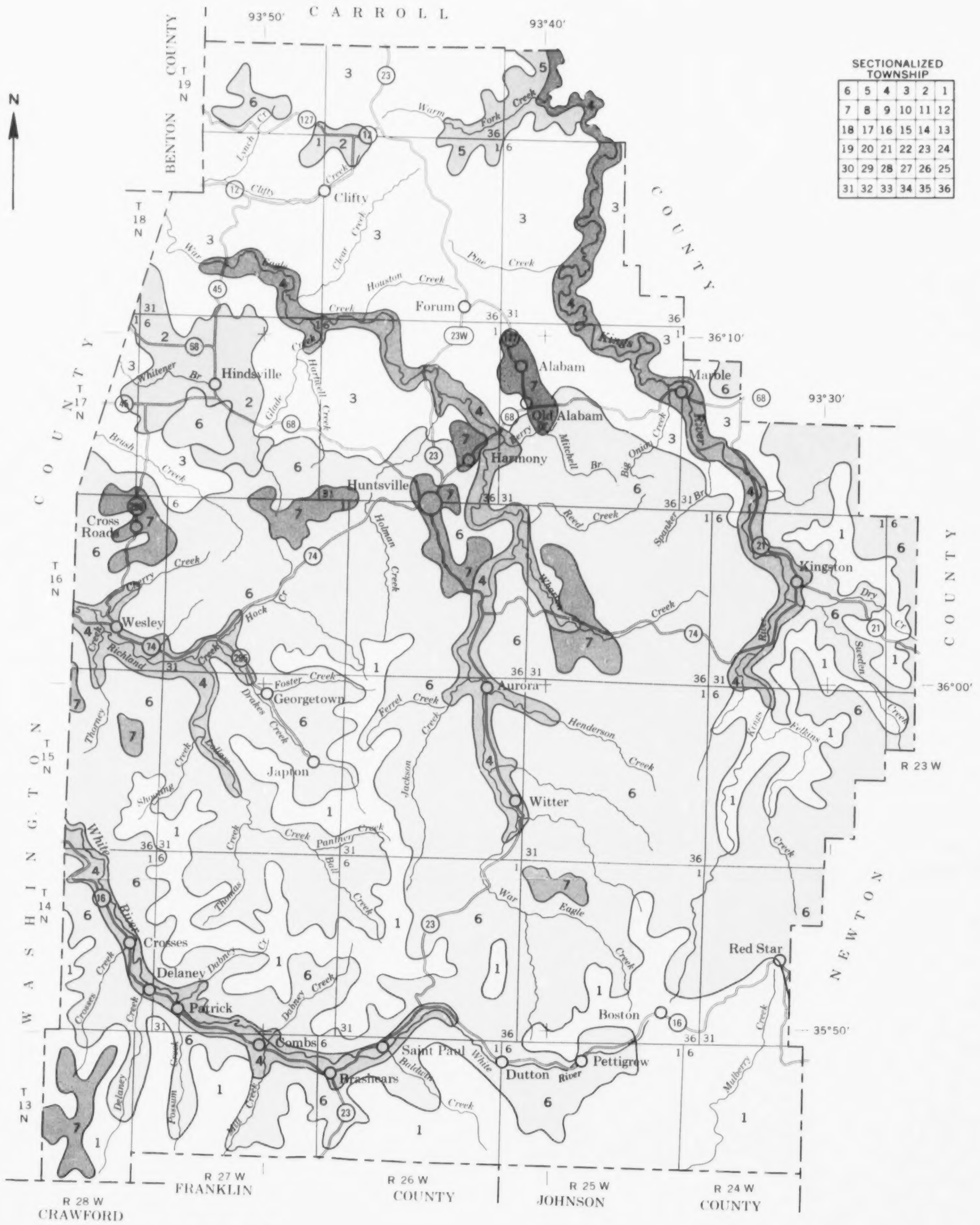
* The horizon was subdivided for sampling purposes.
** The A horizon and the E horizon were combined for sampling purposes.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Allen	Fine-loamy, siliceous, thermic Typic Paleudults
Arkana	Very-fine, mixed, mesic Mollic Hapludalfs
Britwater	Fine-loamy, mixed, mesic Typic Paleudalfs
Captina	Fine-silty, siliceous, mesic Typic Fragiudults
*Ceda	Loamy-skeletal, siliceous, nonacid, thermic Typic Udifluvents
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Cleora	Coarse-loamy, mixed, thermic Fluventic Hapludolls
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Enders	Clayey, mixed, thermic Typic Hapludults
*Healing	Fine-silty, mixed, mesic Typic Argiudolls
Johnsburg	Fine-silty, mixed, mesic Aquic Fragiudults
*Leadvale	Fine-silty, siliceous, thermic Typic Fragiudults
Leesburg	Fine-loamy, siliceous, thermic Typic Paleudults
Linker	Fine-loamy, siliceous, thermic Typic Hapludults
Mayes	Fine, montmorillonitic, thermic Vertic Argiaquolls
Moko	Loamy-skeletal, mixed, mesic Lithic Hapludolls
Mountainburg	Loamy-skeletal, siliceous, thermic Lithic Hapludults
Nella	Fine-loamy, siliceous, thermic Typic Paleudults
Nixa	Loamy-skeletal, siliceous, mesic Glossic Fragiudults
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
*Secesh	Fine-loamy, siliceous, mesic Ultic Hapludalfs
Steprock	Loamy-skeletal, siliceous, thermic Typic Hapludults
Summit Variant	Fine, montmorillonitic, thermic Vertic Argiudolls
Tonti	Fine-loamy, mixed, mesic Typic Fragiudults
Waben	Loamy-skeletal, siliceous, mesic Ultic Hapludalfs

☆ U.S. GOVERNMENT PRINTING OFFICE: 1985 O - 453-551 QL 3


N
CARROLL
BENTON COUNTY
93°50'
93°40'
93°30'
36°10'
36°00'
35°50'
T 19 N
T 18 N
T 17 N
T 16 N
T 15 N
T 14 N
T 13 N
R 28 W
R 27 W
R 26 W
R 25 W
R 24 W
R 23 W
CRAWFORD COUNTY
FRANKLIN COUNTY
JOHNSON COUNTY
WASHINGTON COUNTY
NEWTON COUNTY
Clifty
Forum
Hindsville
Alabam
Old Alabam
Harmony
Marble
Huntsville
Kingston
Cross Roads
Wesley
Georgetown
Japton
Aurora
Witter
Crosses
Delaney
Patrick
Combs
Brashears
Saint Paul
Dutton
Pettigrew
Boston
Red Star
Kings River
White River
War Eagle Creek
Richland Creek
Holman Creek
Drakes Creek
Dry Cr
Sweden Creek
SECTIONALIZED TOWNSHIP
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

LEGEND

1 NELLA-STEPROCK-MOUNTAINBURG: Deep, moderately deep, and shallow, gently sloping to very steep, well drained, gravelly, stony, and very stony soils that formed in colluvium and residuum of sandstone and small amounts of siltstone and shale.

2 TONTI-PERIDGE-CAPTINA: Deep, nearly level to gently sloping, moderately well drained and well drained, loamy and cherty soils that formed in loamy and cherty material

3 NIXA-CLARKSVILLE-NOARK: Deep, gently sloping to very steep, moderately well drained, somewhat excessively drained, and well drained, very cherty soils that formed in residuum of cherty limestone

4 CEDA-LEADVALE-CLEORA: Deep, level to gently sloping, well drained and moderately well drained, loamy, gravelly, and cobbly soils that formed in alluvium derived mainly from sandstone, siltstone, and shale or in colluvium from sandstone and shale

5 ARKANA-MOKO: Moderately deep and shallow, moderately sloping to steep, well drained, very cherty and very stony soils that formed in residuum of limestone or dolomitic limestone

6 ENDERS-LEESBURG: Deep, gently sloping to steep, well drained, stony and gravelly soils that formed in residuum of acid shale and in colluvium from acid shale and sandstone

7 STEPROCK-LINKER-MOUNTAINBURG: Moderately deep and shallow, gently sloping to moderately steep, well drained, loamy, gravelly, and stony soils that formed in residuum of acid sandstone interbedded with siltstone and shale

Compiled 1982

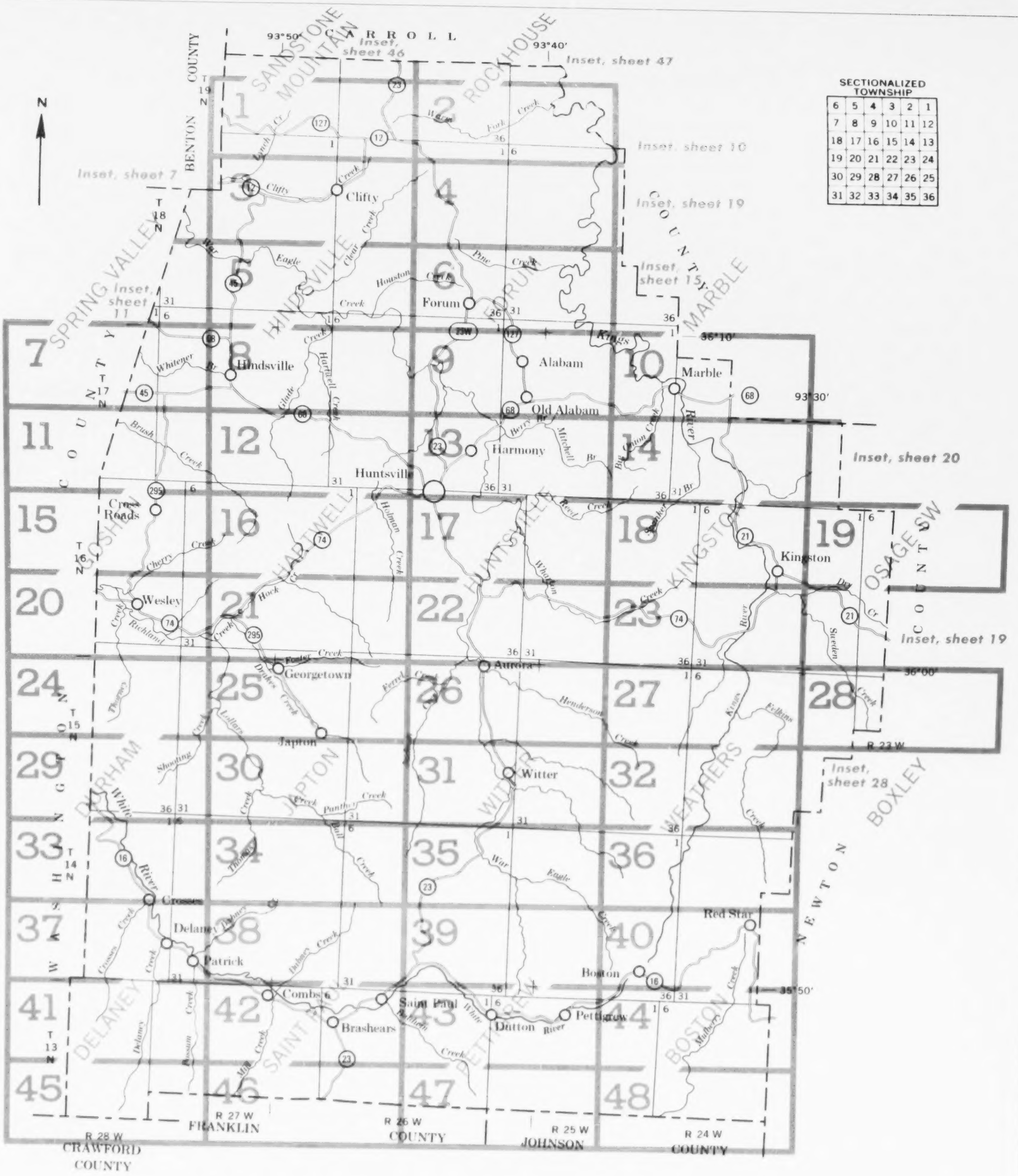
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis ***for decisions on the use of specific tracts.***

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
ARKANSAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

MADISON COUNTY, ARKANSAS

Scale 1:253,440
1 0 1 2 3 4 Miles
1 0 4 8 Km

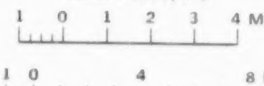

CARROLL
BENTON COUNTY
93°50'
93°40'
93°30'
36°10'
36°00'
35°50'
Inset, sheet 46
Inset, sheet 47
Inset, sheet 7
Inset, sheet 10
Inset, sheet 19
Inset, sheet 15
Inset, sheet 11
Inset, sheet 20
Inset, sheet 19
Inset, sheet 28
SECTIONALIZED TOWNSHIP
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
N
SANDSTONE MOUNTAIN
ROCKHOUSE
SPRING VALLEY
HINDSVILLE
FORUM
MARBLE
GOSHEN
HARTWELL
HUNTSVILLE
KINGSTON
OSAGE SW
DURHAM
JAPTON
WITTER
WEATHERS
BOXLEY
DELANEY
SAINT PAUL
PETTIGREW
BOSTON
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
Clifty
Forum
Alabam
Old Alabam
Marble
Hindsville
Harmony
Huntsville
Kingston
Cross Roads
Wesley
Georgetown
Aurora
Japton
Witter
Sweden
Crosses
Delaney
Patrick
Combs
Saint Paul
Brashears
Dutton
Pettigrew
Boston
Red Star
Kings River
White River
T 19 N
T 18 N
T 17 N
T 16 N
T 15 N
T 14 N
T 13 N
R 28 W
R 27 W
R 26 W
R 25 W
R 24 W
R 23 W
WASHINGTON COUNTY
CRAWFORD COUNTY
FRANKLIN COUNTY
JOHNSON COUNTY
NEWTON COUNTY

NOTE: Map sheets are in a one third quadrangle format. Quadrangle names are listed diagonally across the three map sheets.

INDEX TO MAP SHEETS

MADISON COUNTY, ARKANSAS

Scale 1:253,440


1 0 1 2 3 4 Miles
1 0 4 8 Km

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MADISON COUNTY, ARKANSAS

FOREST SERVICE
ARKANSAS AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The legend is numeric. Soils without a slope designation in the name are those that are found only on nearly level landscapes of occasionally flooded or frequently flooded bottomlands.

SYMBOL	NAME
1	Allen loam, 3 to 8 percent slopes
2	Arkana very cherty silt loam, 8 to 15 percent slopes
3	Arkana-Moko complex, 8 to 20 percent slopes
4	Arkana-Moko complex, 20 to 40 percent slopes
5	Britwater gravelly silt loam, 3 to 8 percent slopes
6	Captina silt loam, 1 to 3 percent slopes
7	Ceda gravelly fine sandy loam, occasionally flooded
8	Ceda cobbly fine sandy loam, frequently flooded
9	Clarksville very cherty silt loam, 20 to 50 percent slopes
10	Cleora fine sandy loam, occasionally flooded
11	Elsah very cherty silt loam, occasionally flooded
12	Enders gravelly loam, 3 to 8 percent slopes
13	Enders gravelly loam, 8 to 12 percent slopes
14	Enders stony loam, 3 to 12 percent slopes
15	Enders-Leesburg stony loams, 8 to 20 percent slopes
16	Enders-Leesburg stony loams, 20 to 40 percent slopes
17	Healing silt loam, 1 to 3 percent slopes
18	Johnsburg silt loam, 0 to 1 percent slopes
19	Leadvale loam, 3 to 8 percent slopes
20	Leesburg gravelly loam, 3 to 8 percent slopes
21	Leesburg gravelly loam, 8 to 12 percent slopes
22	Leesburg stony loam, 8 to 20 percent slopes
23	Linker loam, 3 to 8 percent slopes
24	Mayes silty clay loam, 0 to 1 percent slopes
25	Moko very stony silt loam, very rocky, 12 to 40 percent slopes
26	Mountainburg gravelly loam, 3 to 12 percent slopes
27	Mountainburg stony loam, 3 to 20 percent slopes
28	Mountainburg very stony loam, 20 to 50 percent slopes
29	Nella gravelly loam, 3 to 8 percent slopes
30	Nella gravelly loam, 8 to 12 percent slopes
31	Nella gravelly loam, 12 to 20 percent slopes
32	Nella stony loam, 8 to 20 percent slopes
33	Nella-Steprock-Mountainburg very stony loams, 20 to 40 percent slopes
34	Nella-Steprock-Mountainburg very stony loams, 40 to 60 percent slopes
35	Nixa very cherty silt loam, 3 to 8 percent slopes
36	Nixa very cherty silt loam, 8 to 15 percent slopes
37	Noark very cherty silt loam, 8 to 12 percent slopes
38	Noark very cherty silt loam, 12 to 20 percent slopes
39	Noark very cherty silt loam, 20 to 45 percent slopes
40	Peridge silt loam, 1 to 3 percent slopes
41	Peridge silt loam, 3 to 8 percent slopes
42	Secesh gravelly silt loam, occasionally flooded
43	Steprock gravelly loam, 3 to 8 percent slopes
44	Steprock stony loam, 3 to 12 percent slopes
45	Summit Variant silty clay loam, 3 to 12 percent slopes
46	Summit Variant stony silty clay loam, 12 to 25 percent slopes
47	Tonti cherty silt loam, 3 to 8 percent slopes
48	Waben very cherty silt loam, 3 to 12 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

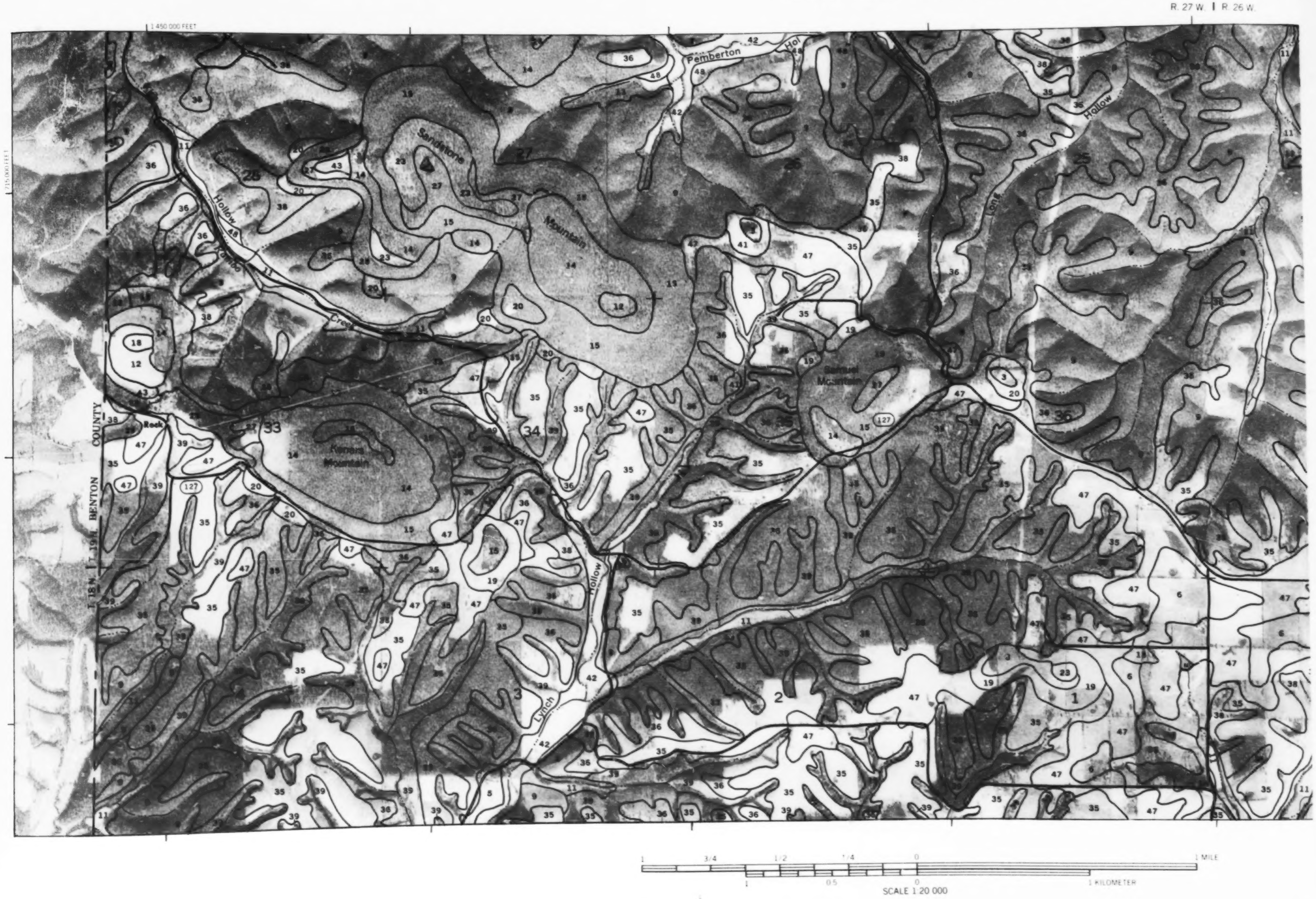
BOUNDARIES	
County or parish	——— –
Minor civil division	— — —
Reservation (national forest or park, state forest or park, and large airport)	—— · ——
Field sheet matchline & neatline	————
AD HOC BOUNDARY (label)	Hedley Airstrip ┼
Small airport, airfield, park, oilfield, cemetery, or flood pool	FLOOD POOL LINE
STATE COORDINATE TICK	——┴——
LAND DIVISION CORNERS (sections and land grants)	└ ┴ ┼ ┬┴
ROADS	————
ROAD EMBLEM & DESIGNATIONS	
State	㉘
DAMS	
Large (to scale)	⬭
Medium or small	water w
PITS	
Mine or quarry	⚒

WATER FEATURES

DRAINAGE	
Perennial, double line	═══
Perennial, single line	—·—·—
Intermittent	— · · —
Drainage end	— · · —►
LAKES, PONDS AND RESERVOIRS	
Perennial	water w
MISCELLANEOUS WATER FEATURES	
Wet spot	↓

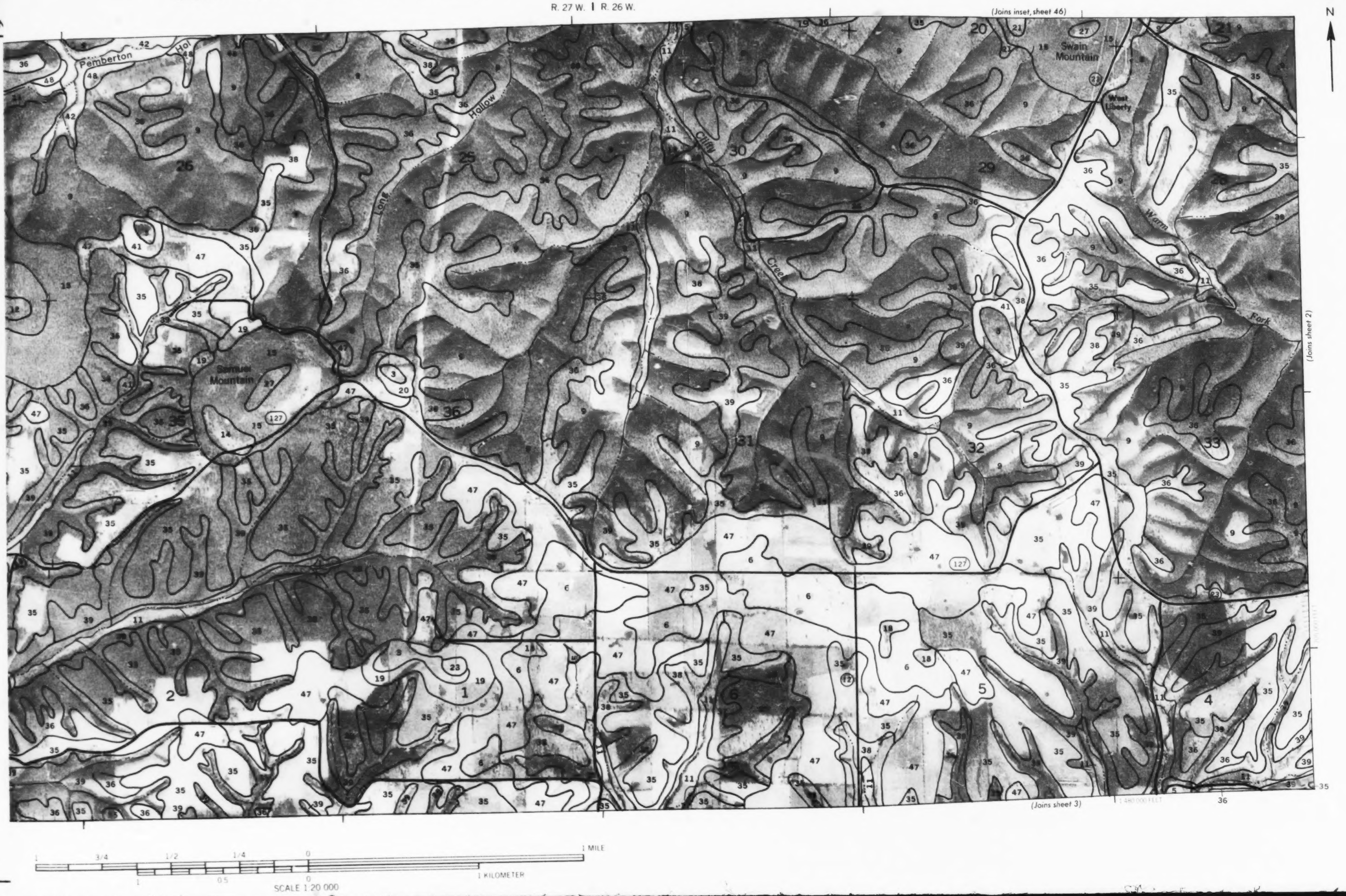
SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS	1 48
ESCARPMENTS	
Bedrock (points down slope)	••••••••••••••••••
GULLY	
DEPRESSION OR SINK	◇
MISCELLANEOUS	
Gravelly spot	∴
Rock outcrop (includes sandstone and shale)	•
Stony spot, very stony spot	○ ⊡

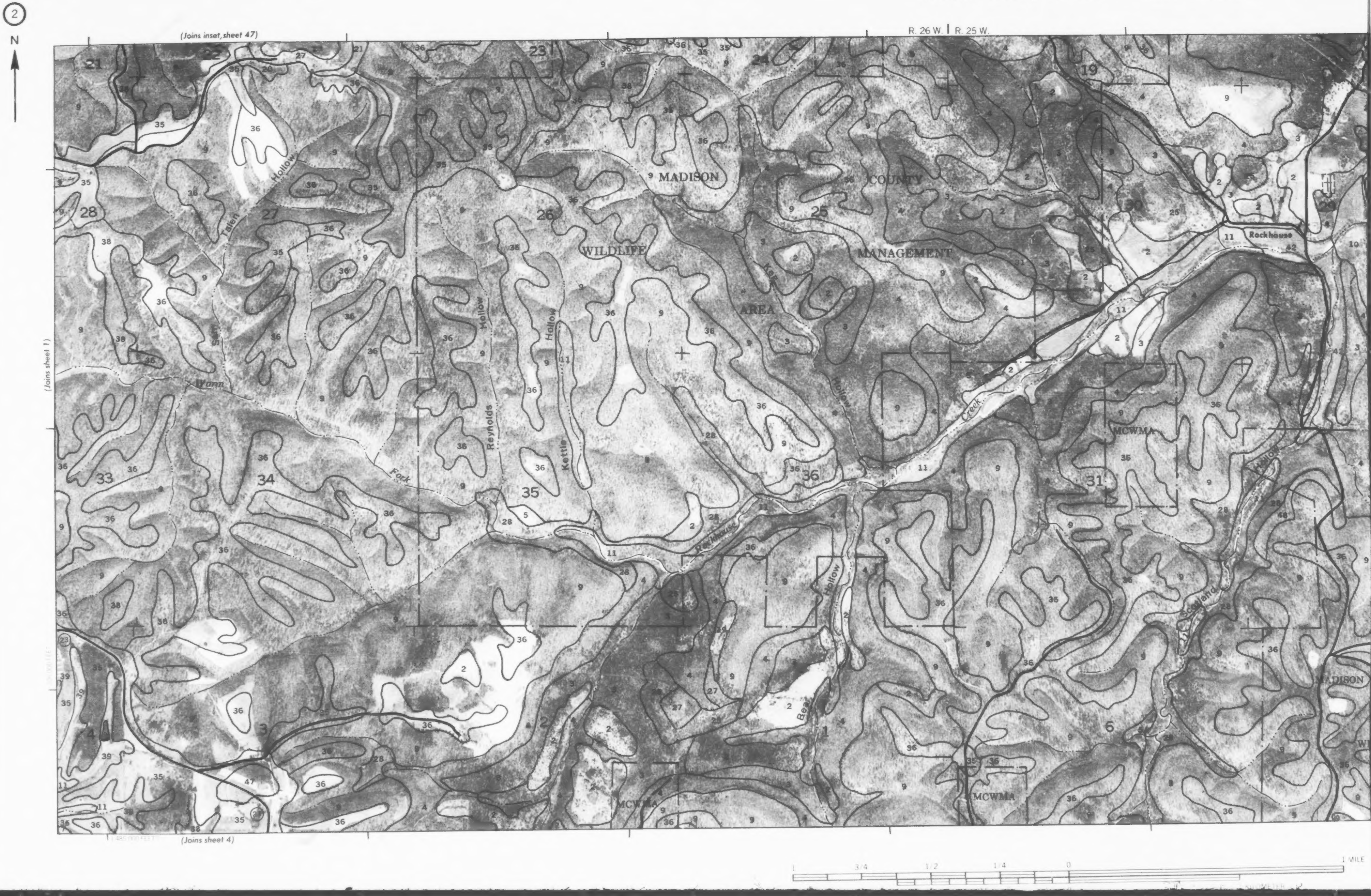

R. 27 W. | R. 26 W.
1 450 000 FEET
715 000 FEET
Pemberton
Hollow
Sandstone
Mountain
Hollow
Rambo
Creek
Long
Hollow
Samuel Mountain
Rimers Mountain
Rock
BENTON COUNTY
T. 19 N.
T. 18 N.
Hollow
Lynch
127
25
26
27
28
33
34
35
36
1
2
3
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 1

①

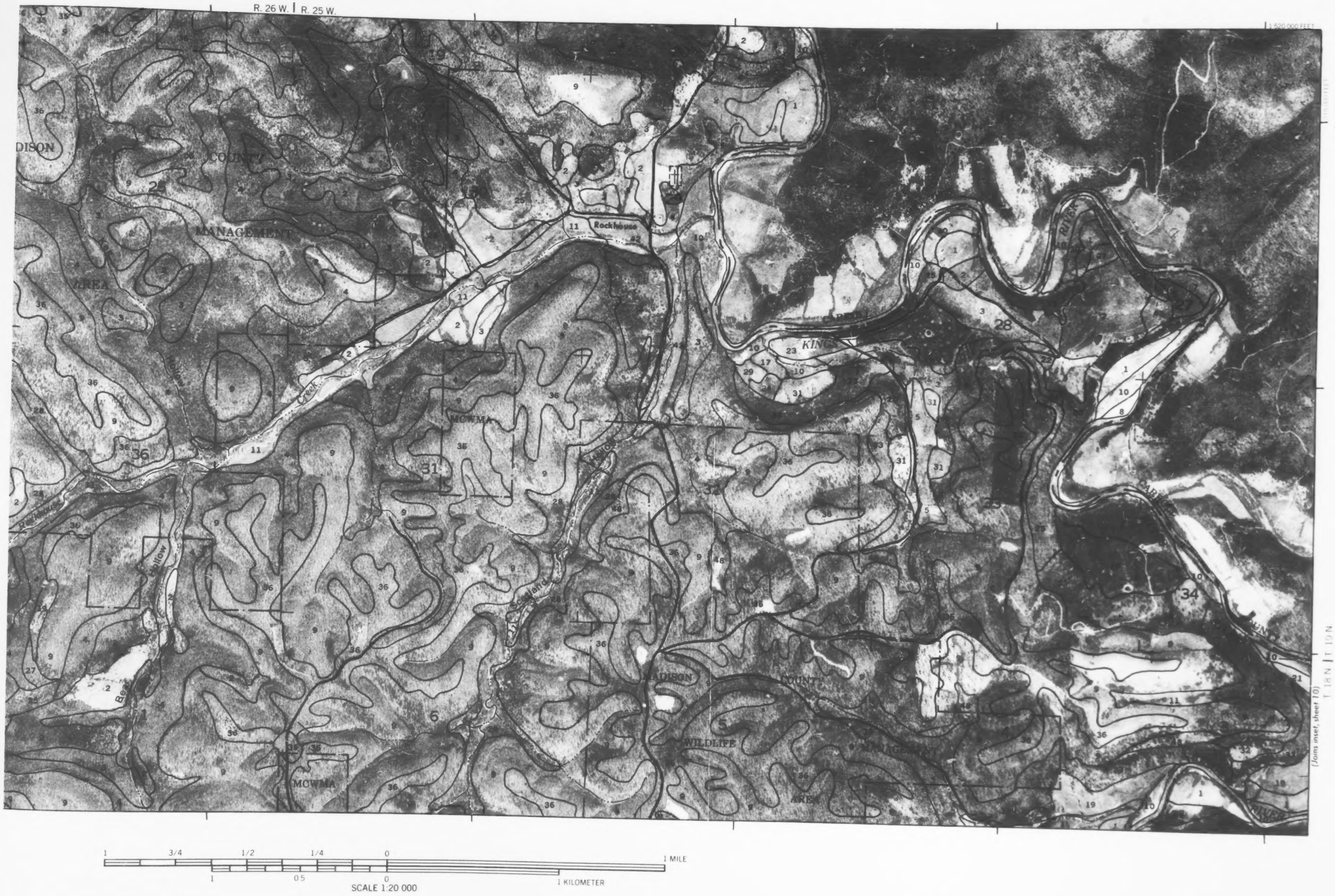

R. 27 W. | R. 26 W.
(Joins inset, sheet 46)
N
(Joins sheet 2)
(Joins sheet 3)
Pemberton Hol
Long Hollow
Samuel Mountain
Swain Mountain
West Liberty
Clifty Creek
Warm Fork
127
23
12
26
25
30
29
28
36
35
31
32
33
2
1
6
5
4
20
21
1 480 000 FEET
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
1
0.5
0
SCALE 1:20 000

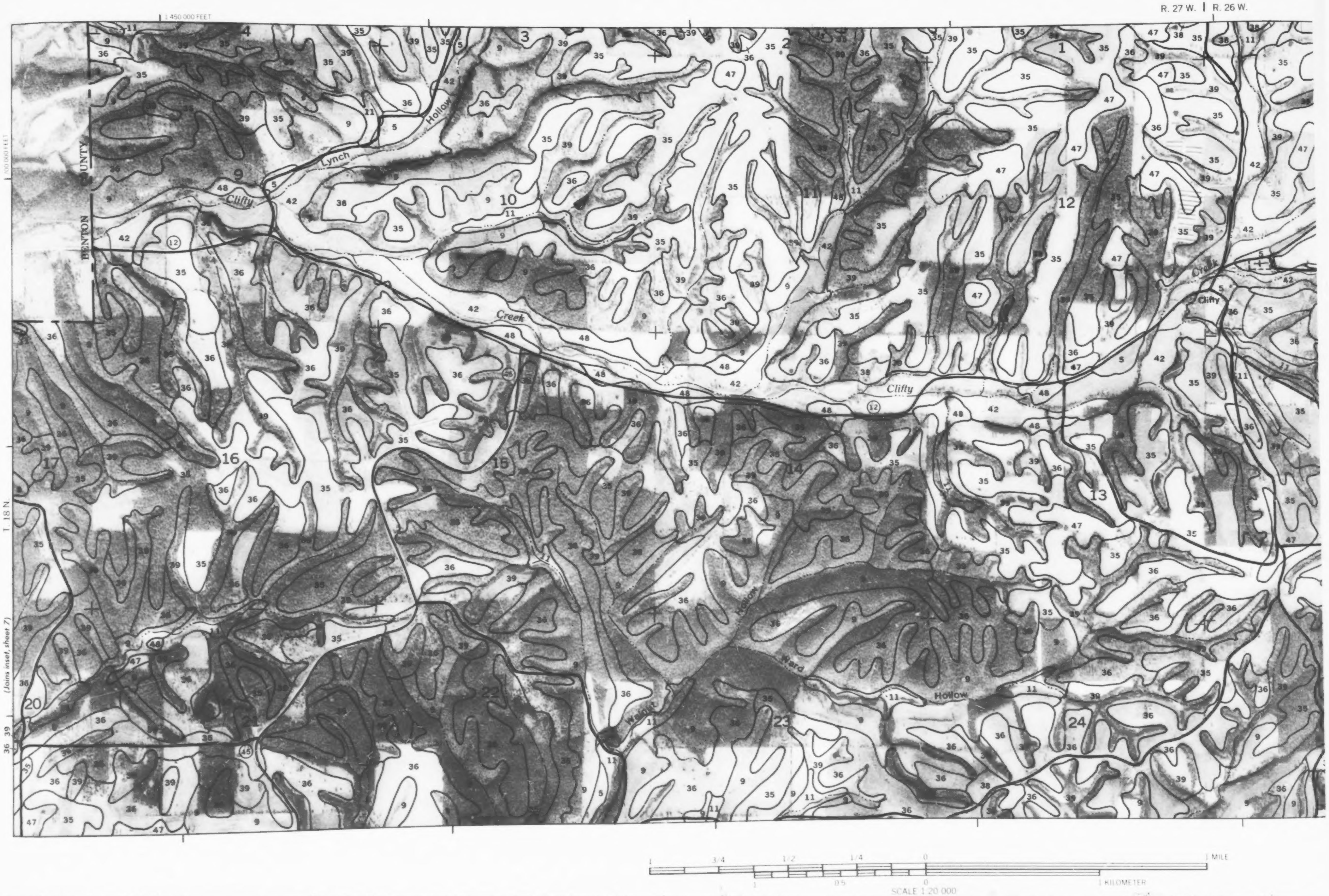
MADISON COUNTY, ARKANSAS — SHEET NUMBER 2



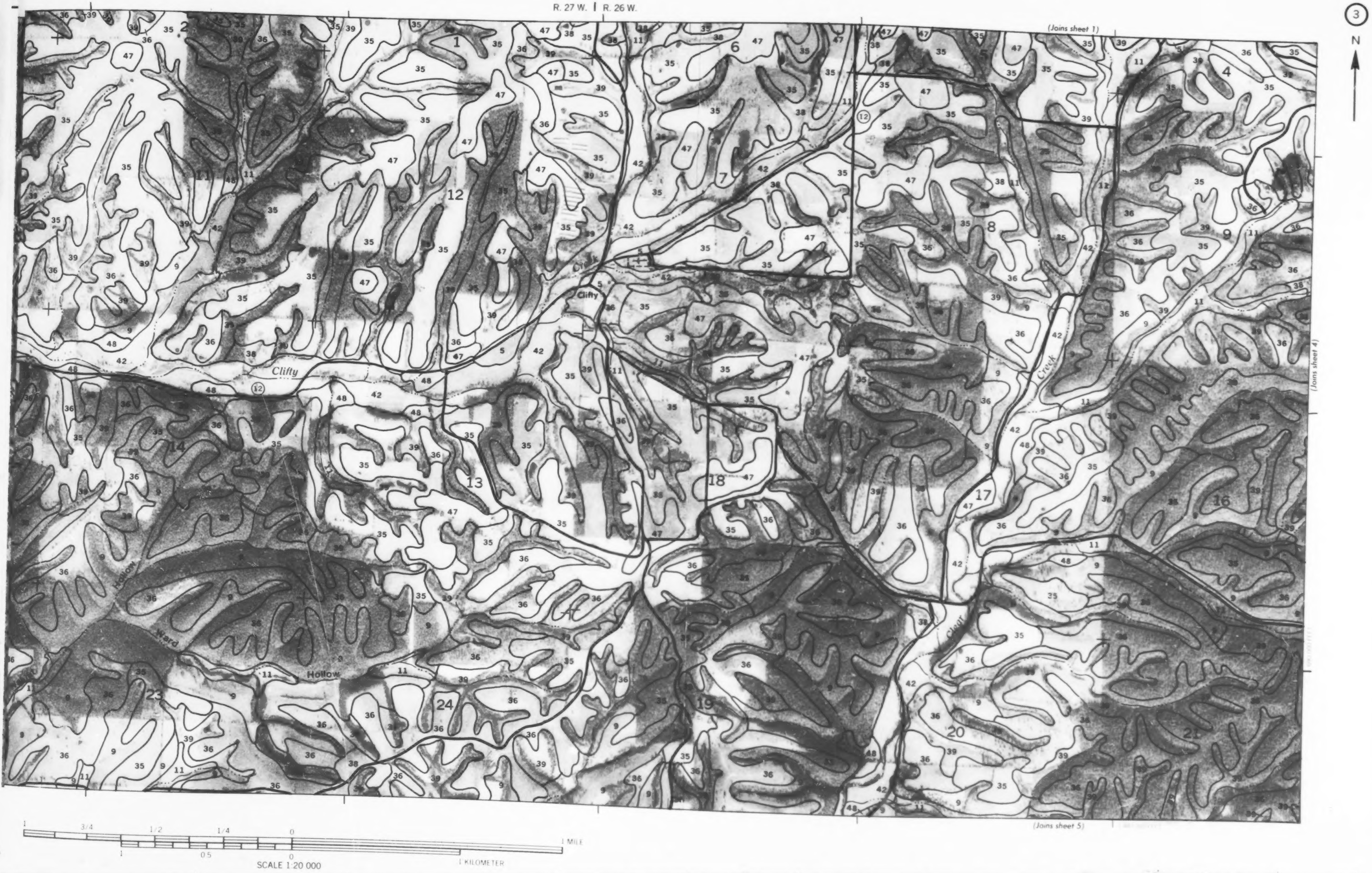
2
N
(Joins inset, sheet 47)
R. 26 W. | R. 25 W.
(Joins sheet 1)
(Joins sheet 4)
MADISON COUNTY WILDLIFE MANAGEMENT AREA
MCWMA
Rockhouse
Rockhouse Creek
Warm Fork
Talen Hollow
Reynolds Hollow
Kettle Hollow
Bear Hollow
Scotland Hollow
MADISON
1 3/4 1/2 1/4 0 1 MILE

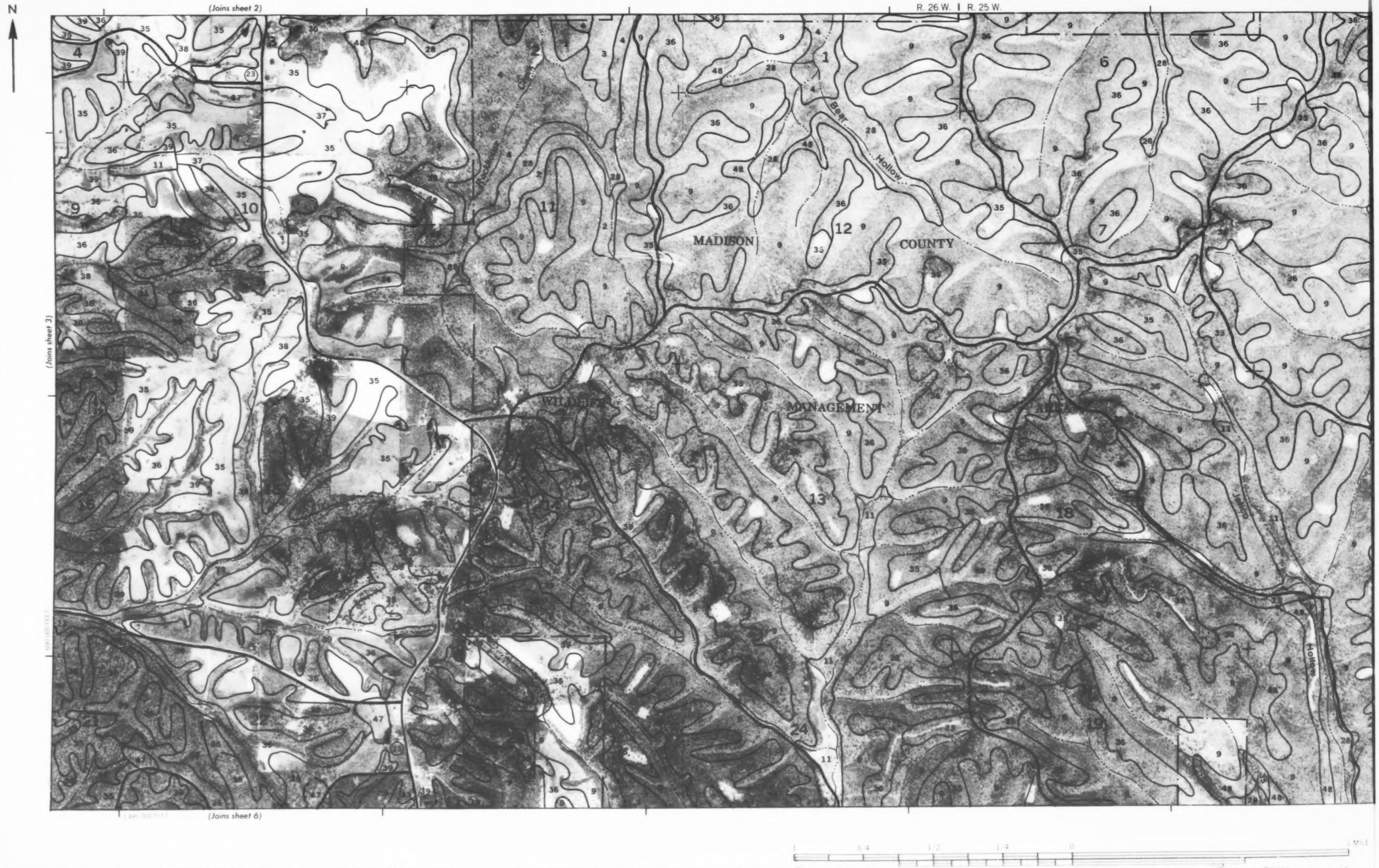
MADISON COUNTY, ARKANSAS — SHEET NUMBER 2


R. 26 W. | R. 25 W.
1 520 000 FEET
MADISON COUNTY
MANAGEMENT
AREA
Rockhouse
KINGS RIVER
MCWMA
Creek
Hollow
MADISON COUNTY
WILDLIFE MANAGEMENT AREA
T. 18 N. | T. 19 N.
(Joins inset, sheet 10)
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

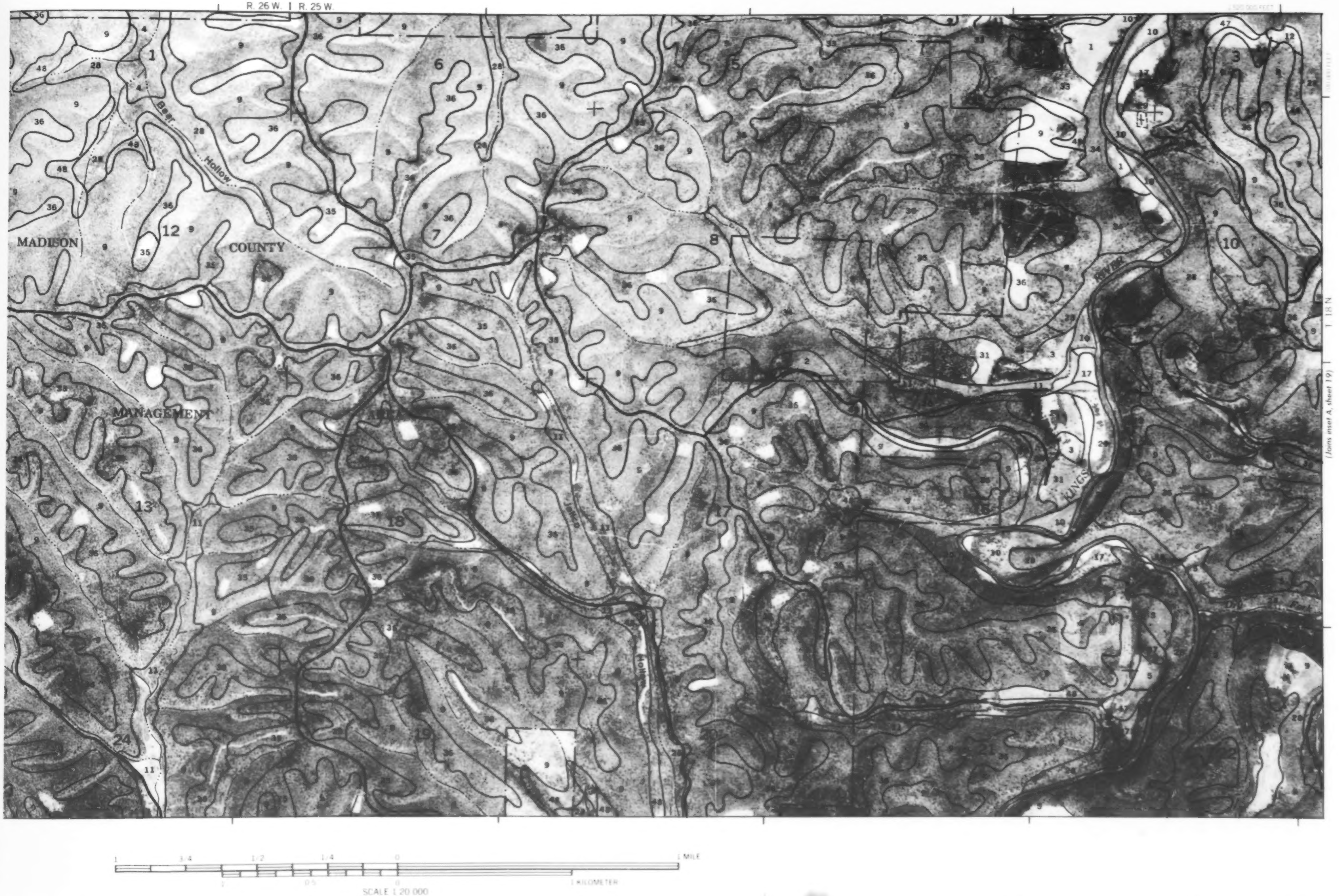

R. 27 W.
R. 26 W.
1 450 000 FEET
BENTON COUNTY
T. 18 N.
(Joins inset, sheet 7)
36 39
Lynch
Hollow
Clifty
Creek
Clifty
Creek
Clifty
Ward
Hollow
Hollow
Walnut
1
2
3
4
9
10
11
12
13
14
15
16
17
20
21
22
23
24
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
1
0.5
0
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 3

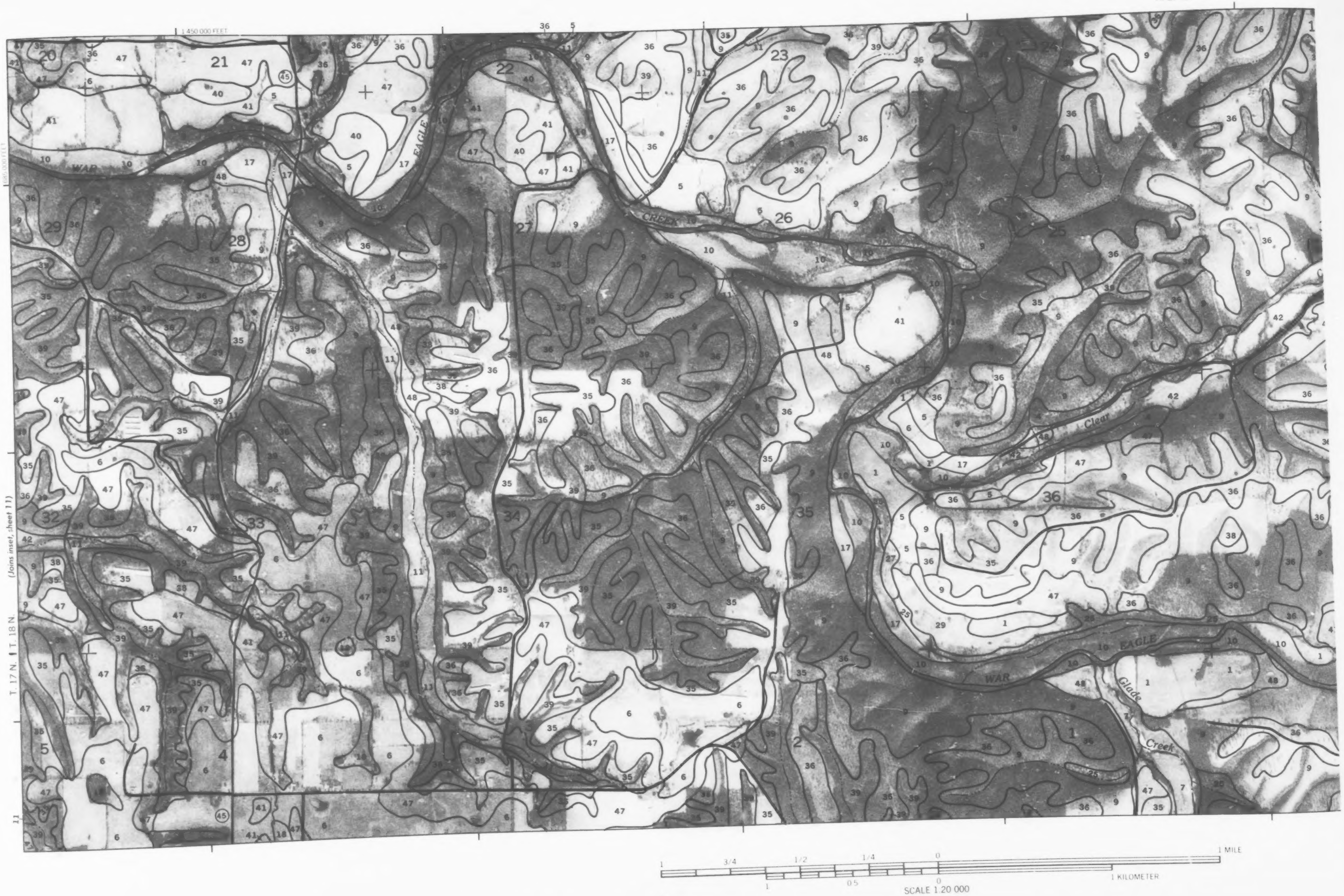

R. 27 W.
R. 26 W.
(Joins sheet 1)
(Joins sheet 4)
(Joins sheet 5)
3
N
Clifty
Clifty
Creek
Creek
Creek
Ward
Hollow
Hollow
12
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18
19
20
21
23
24
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 2)
R. 26 W. | R. 25 W.
(Joins sheet 3)
(Joins sheet 6)
MADISON
COUNTY
WILDLIFE
MANAGEMENT
AREA
Bear
Hollow
Hollow
23
1
2
3
4
6
7
9
10
11
12
13
16
18
19
22
24
35
36
39
48
1
3/4
1/2
1/4
0
1 MILE

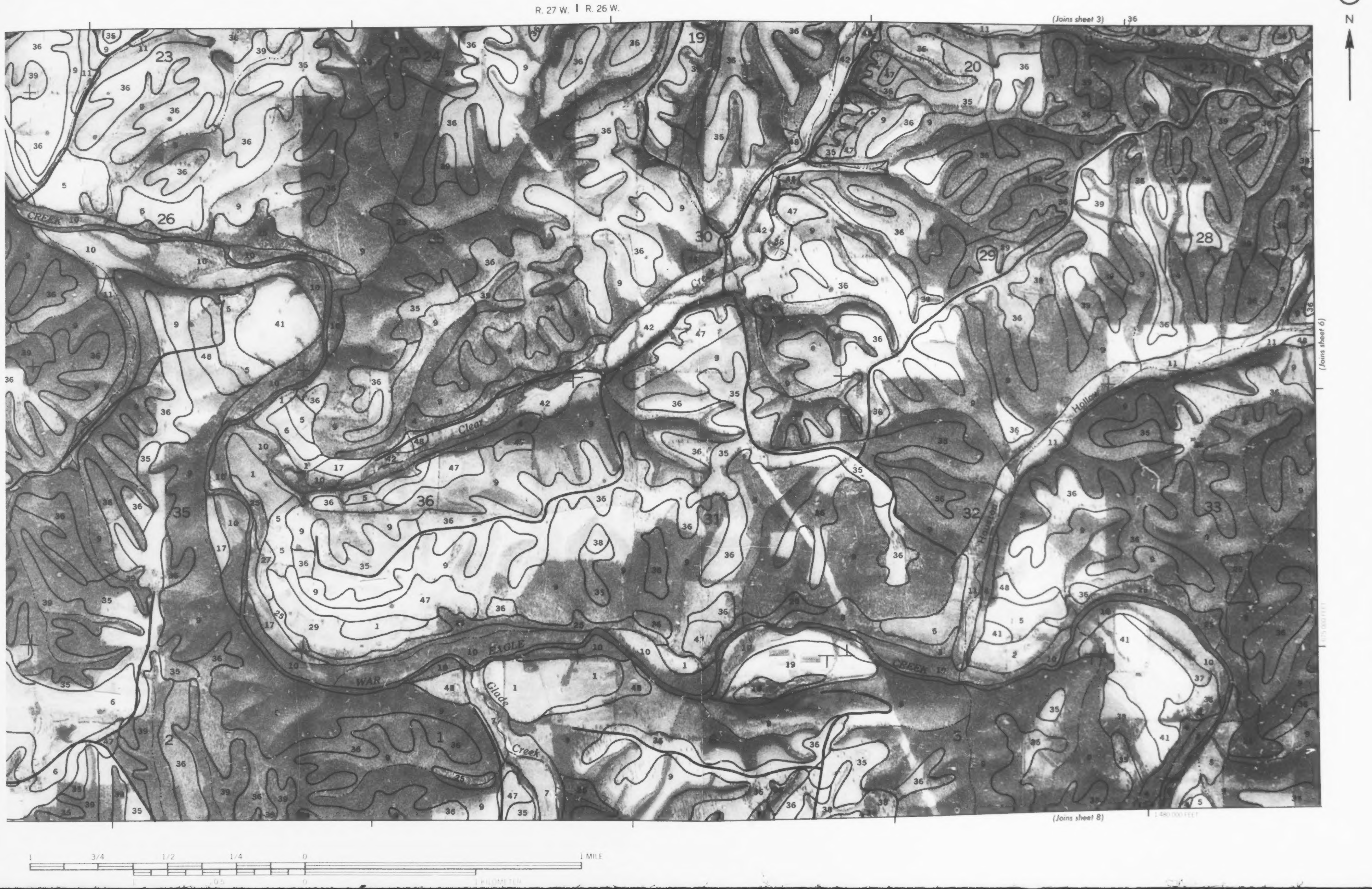
MADISON COUNTY, ARKANSAS — SHEET NUMBER 4


R. 26 W.
R. 25 W.
T. 18 N.
(Joins inset A, sheet 19)
MADISON
COUNTY
MANAGEMENT
Bear
Hollow
Kings
River
Hollow
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000

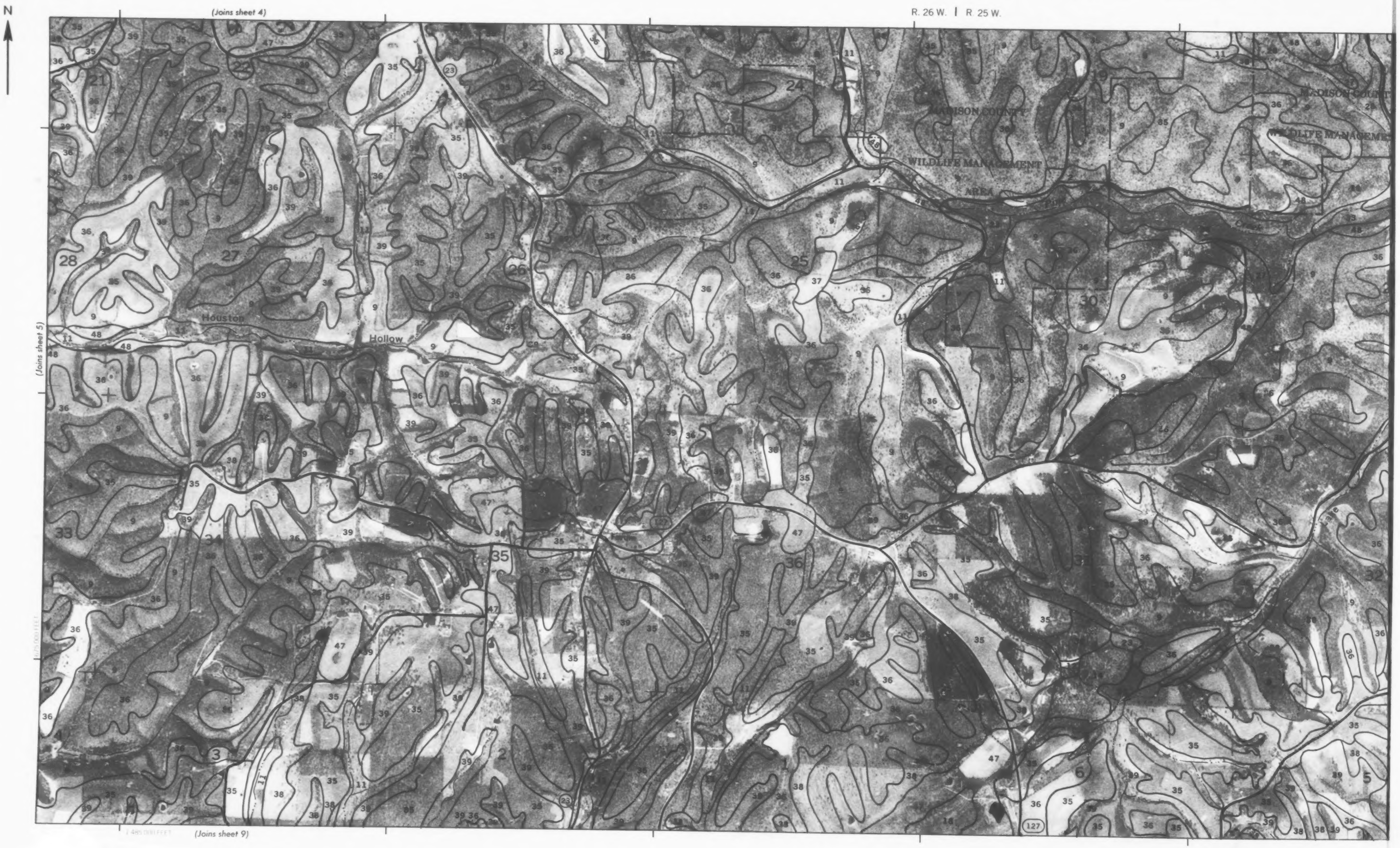
MADISON COUNTY, ARKANSAS — SHEET NUMBER 5


R. 27 W.
R. 26 W.
1 450 000 FEET
(Joins inset, sheet 11)
T. 17 N.
T. 18 N.
WAR
EAGLE
CREEK
Clear
Glade
Creek
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
1
2
4
5
1 MILE
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 5

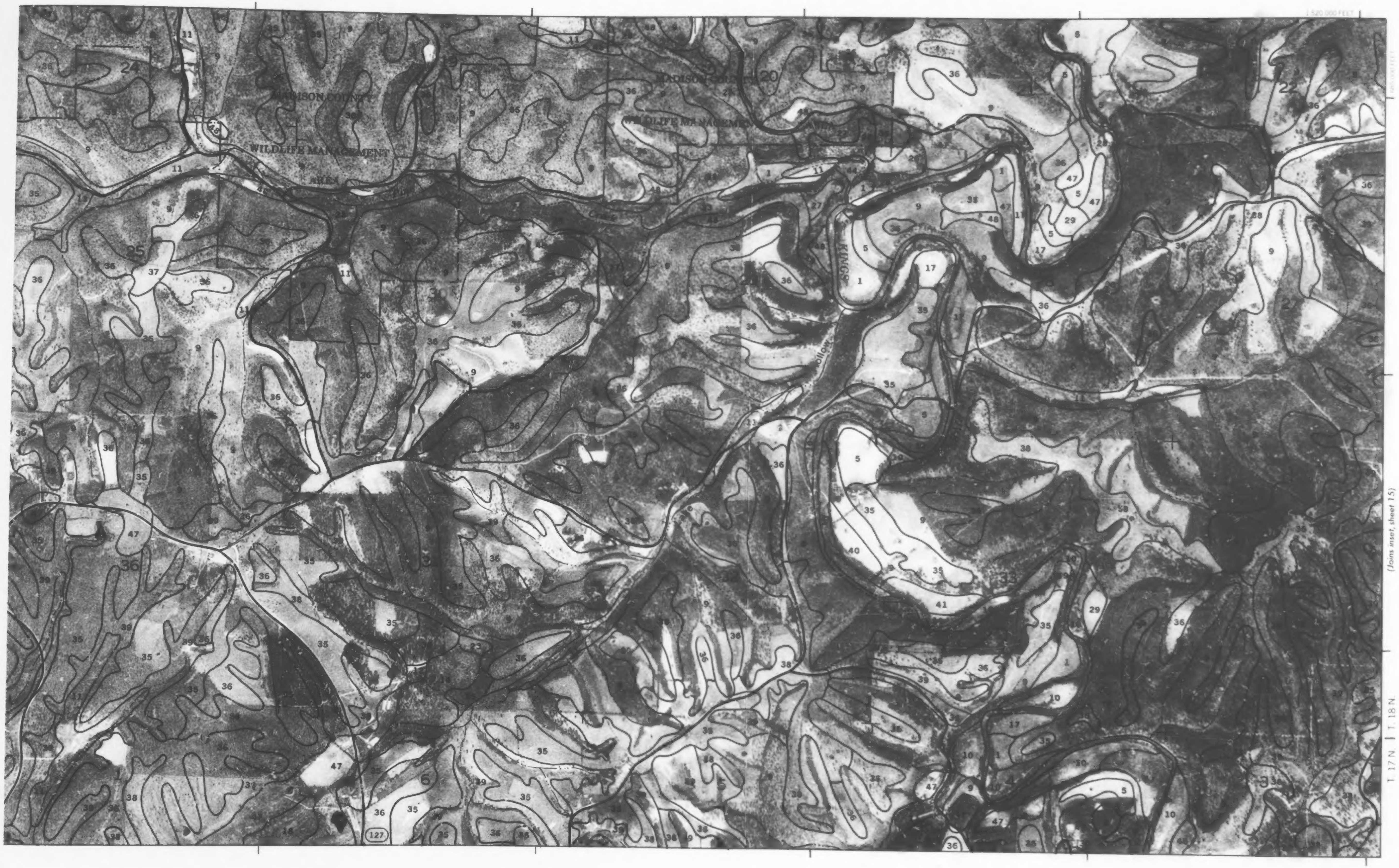

R. 27 W.
R. 26 W.
(Joins sheet 3)
(Joins sheet 6)
(Joins sheet 8)
N
1 480 000 FEET
CREEK
Clear Creek
WAR EAGLE CREEK
Glade Creek
Houston Hollow
19
20
21
23
24
25
26
28
29
30
31
32
33
35
36
1
2
3
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER

MADISON COUNTY, ARKANSAS — SHEET NUMBER 6


N
(Joins sheet 4)
R. 26 W. | R 25 W.
(Joins sheet 5)
(Joins sheet 9)
MADISON COUNTY
WILDLIFE MANAGEMENT
AREA
Houston
Hollow
21
22
23
24
25
26
27
28
30
32
33
34
35
36
1
2
3
4
5
6
23
127
48

MADISON COUNTY, ARKANSAS — SHEET NUMBER 6

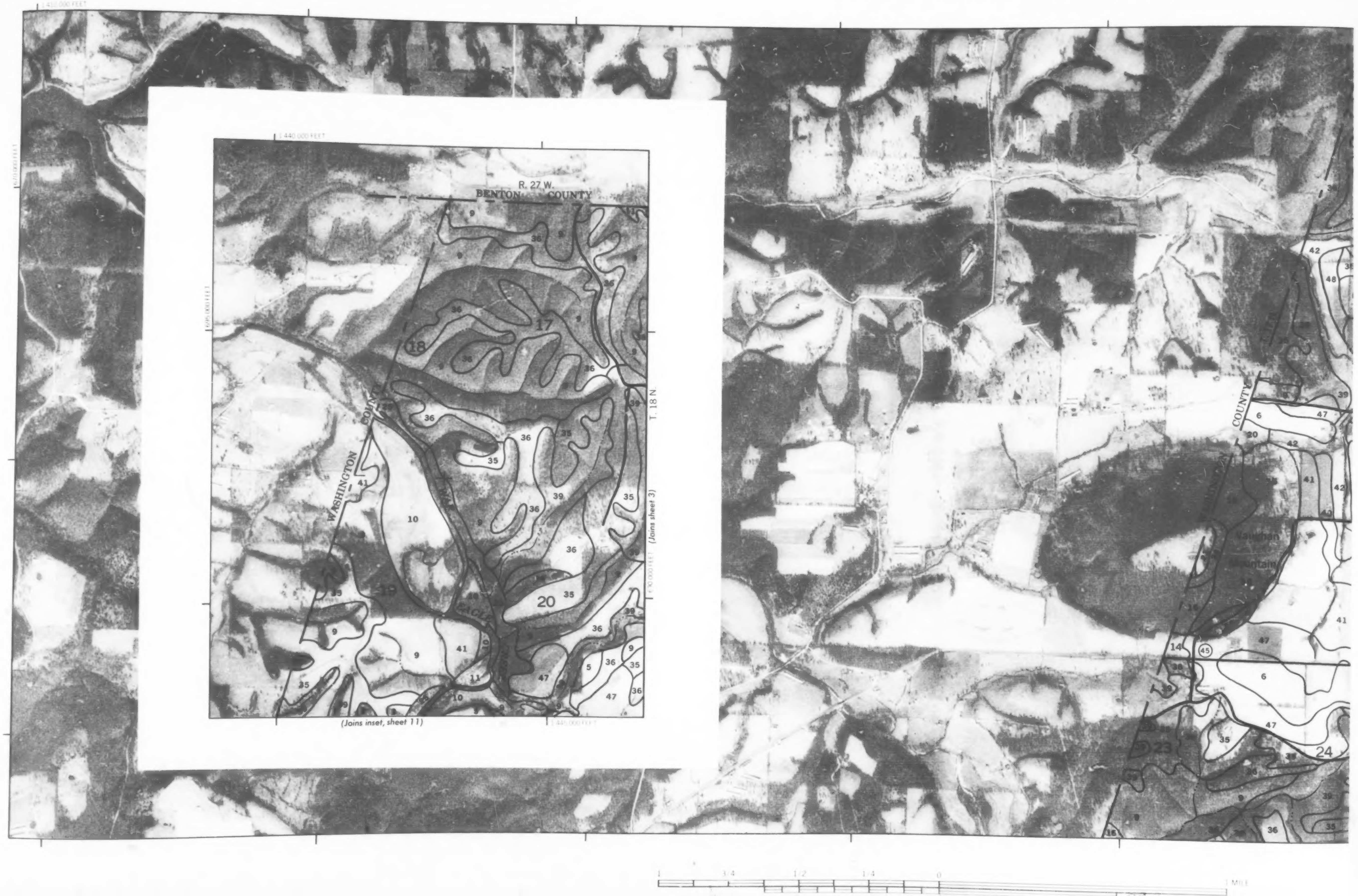
R. 26 W. | R. 25 W.


1 520 000 FEET
MADISON COUNTY
WILDLIFE MANAGEMENT
AREA
MADISON COUNTY
WILDLIFE MANAGEMENT
KINGS
Hollow
127
24
25
30
20
21
22
36
6
(Joins inset, sheet 15)
T. 17 N. | T. 18 N.

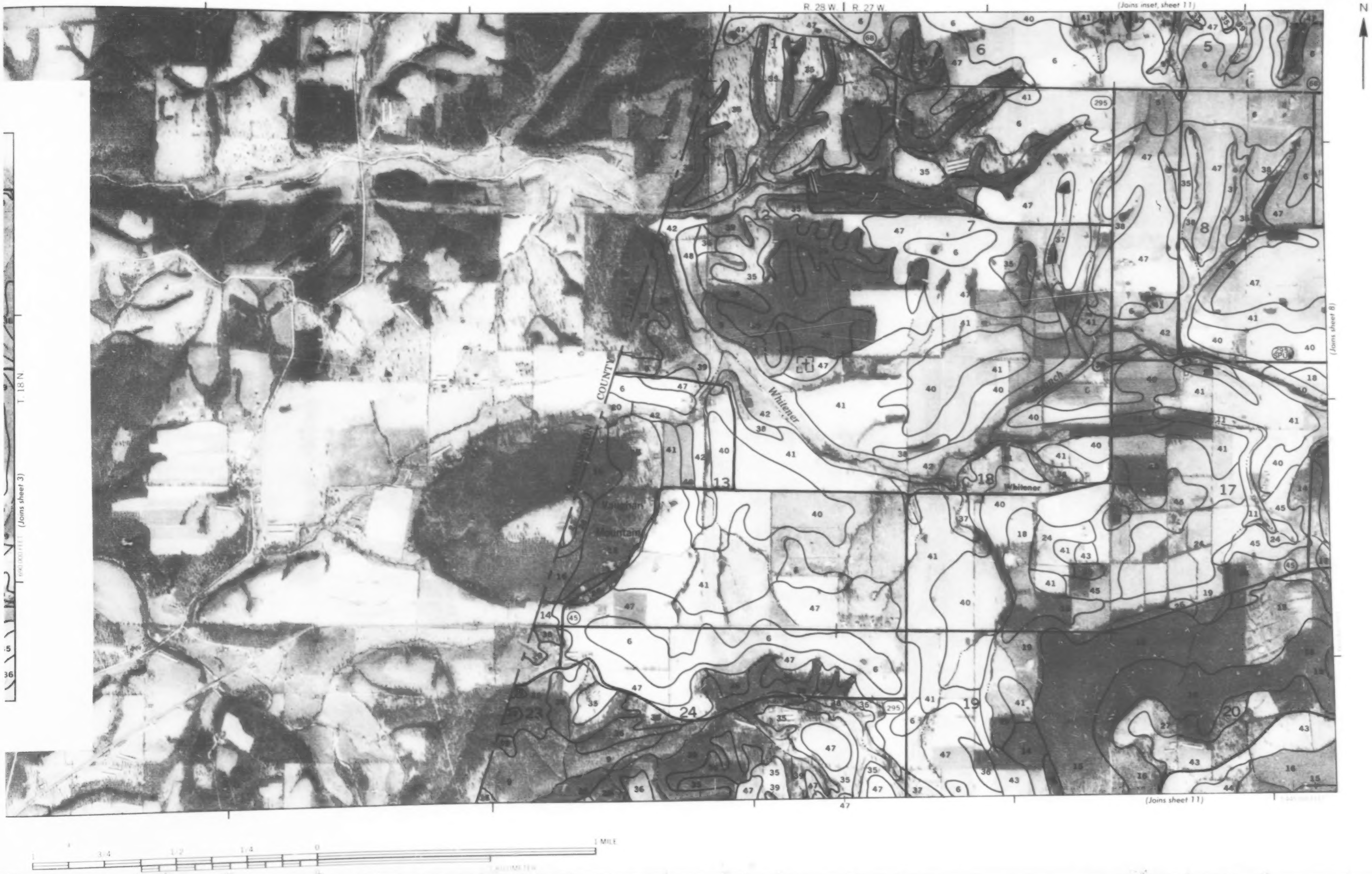
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

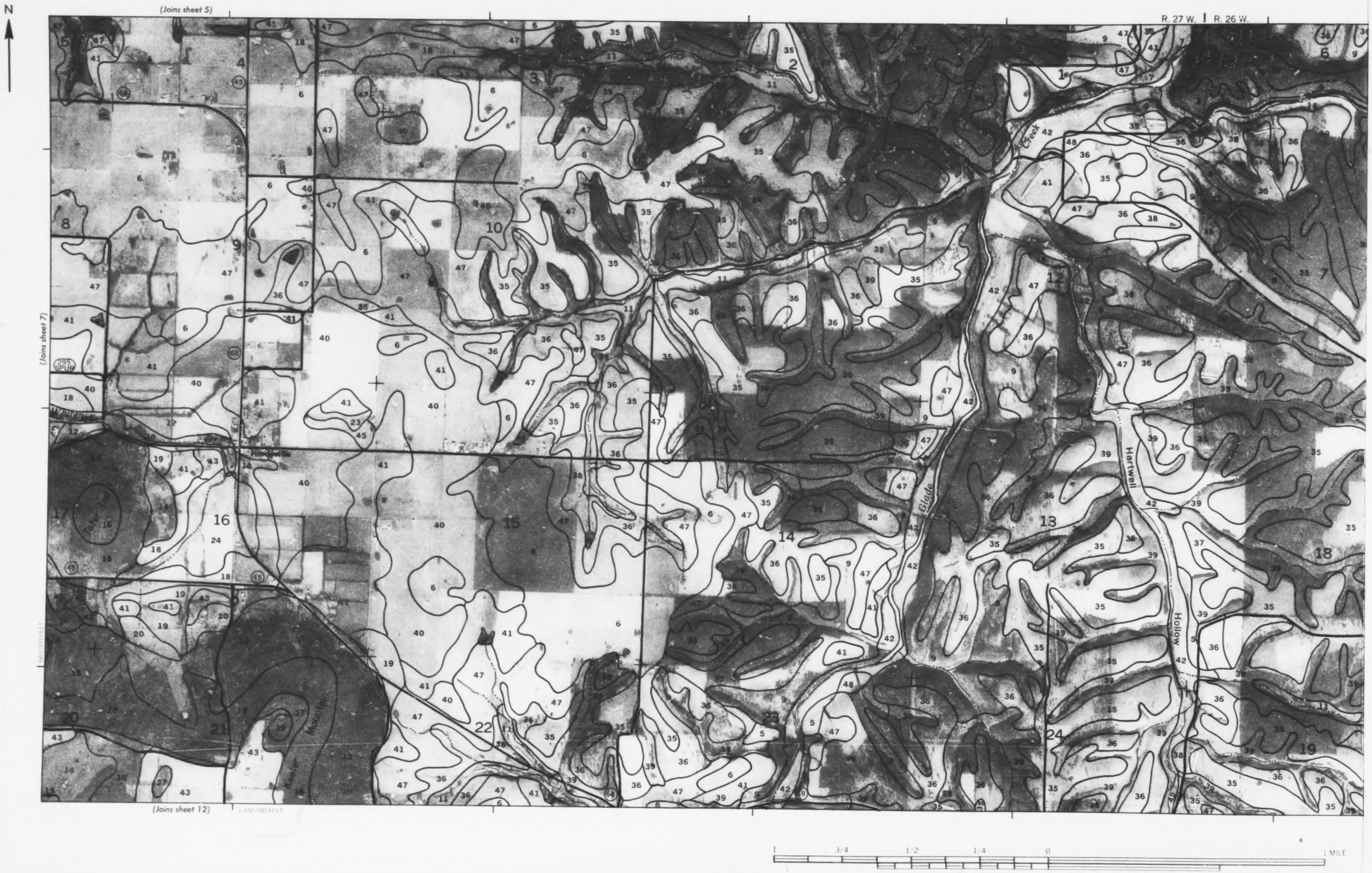
SCALE 1:20 000


R. 27 W.
BENTON COUNTY
WASHINGTON COUNTY
T. 18 N.
(Joins sheet 3)
(Joins inset, sheet 11)
1 440 000 FEET
1 445 000 FEET
COUNTY
Vaughan Mountain
45
1
3/4
1/2
1/4
0
1 MILE

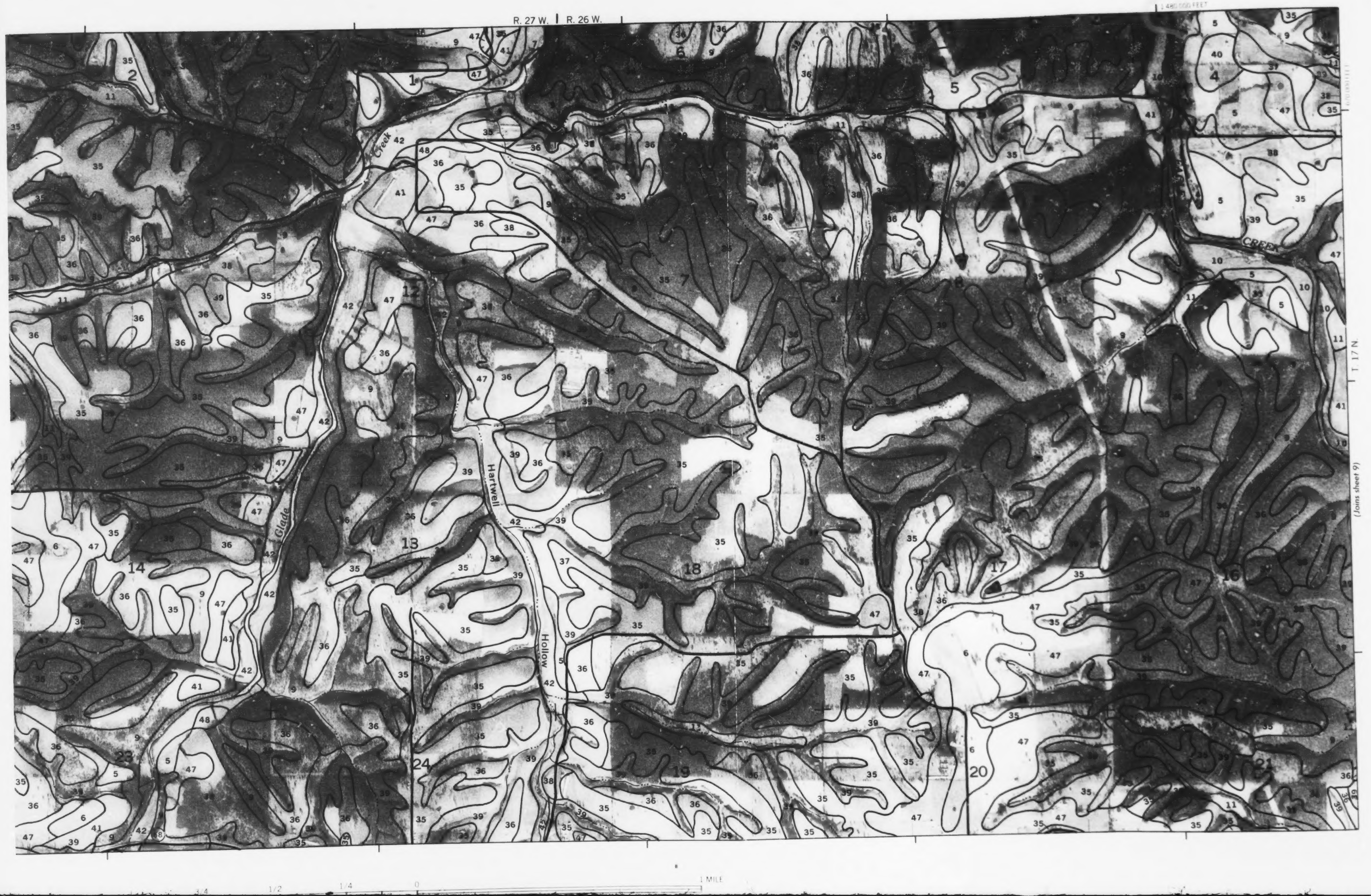
MADISON COUNTY, ARKANSAS — SHEET NUMBER 7

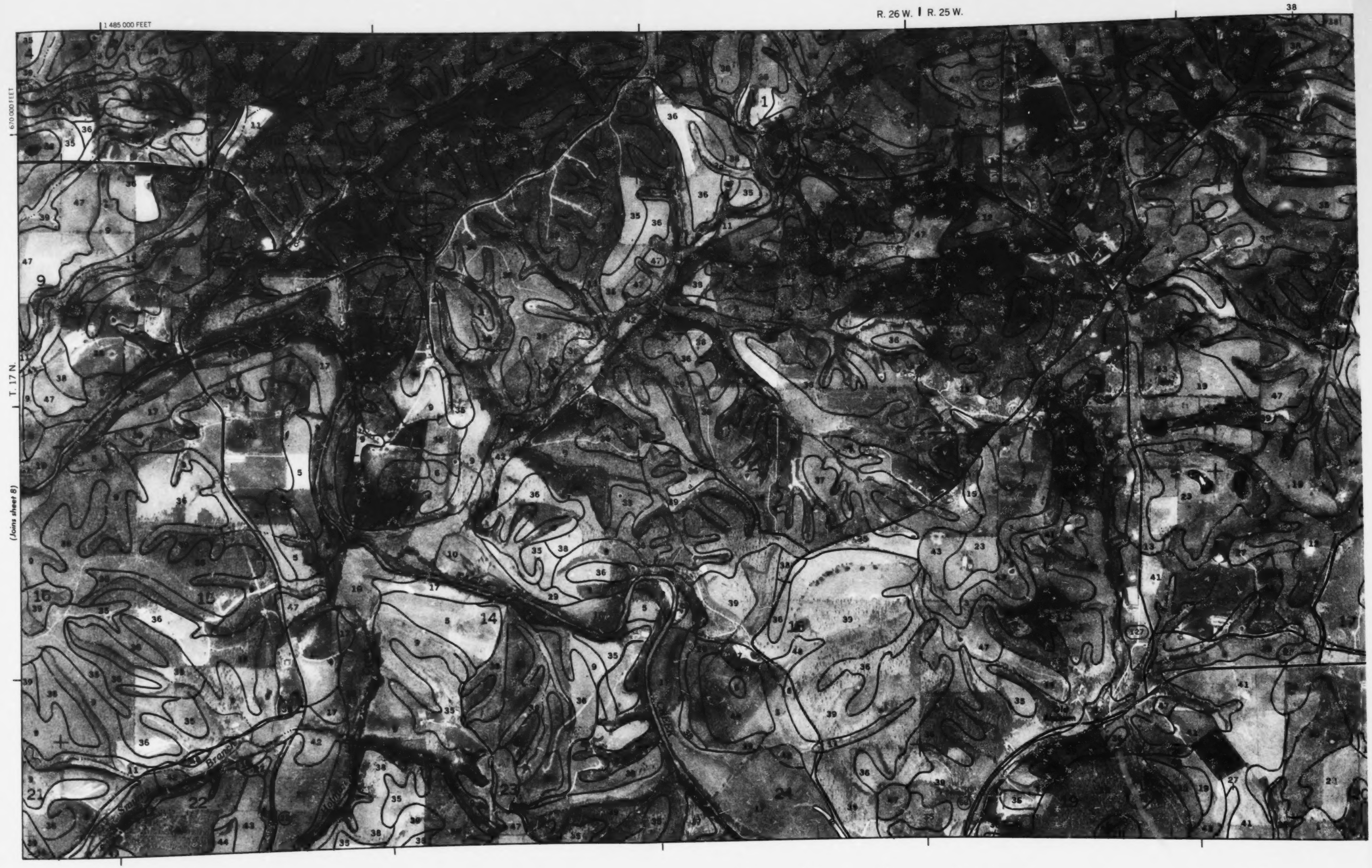

R. 28 W. | R. 27 W.
(Joins inset, sheet 11)
N
T. 18 N.
(Joins sheet 3)
(Joins sheet 8)
(Joins sheet 11)
Whitener
Branch
Vaughan Mountain
COUNTY
1
6
5
7
8
13
18
17
24
23
19
20
1 MILE
3/4
1/2
1/4
0
1 KILOMETER

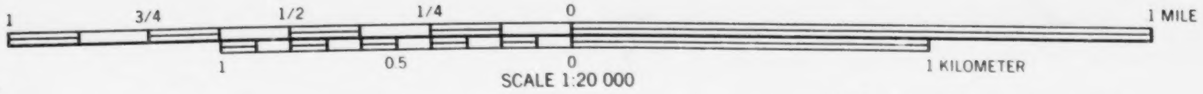
MADISON COUNTY, ARKANSAS — SHEET NUMBER 8


N
(Joins sheet 5)
R. 27 W.
R. 26 W.
(Joins sheet 7)
(Joins sheet 12)
Hindsville
Creek
Glade
Hartwell
Hollow
Tater Hill
Keeler
Mountain
295 SPUR
45
68
1
3/4
1/2
1/4
0
1 MILE

MADISON COUNTY, ARKANSAS — SHEET NUMBER 8

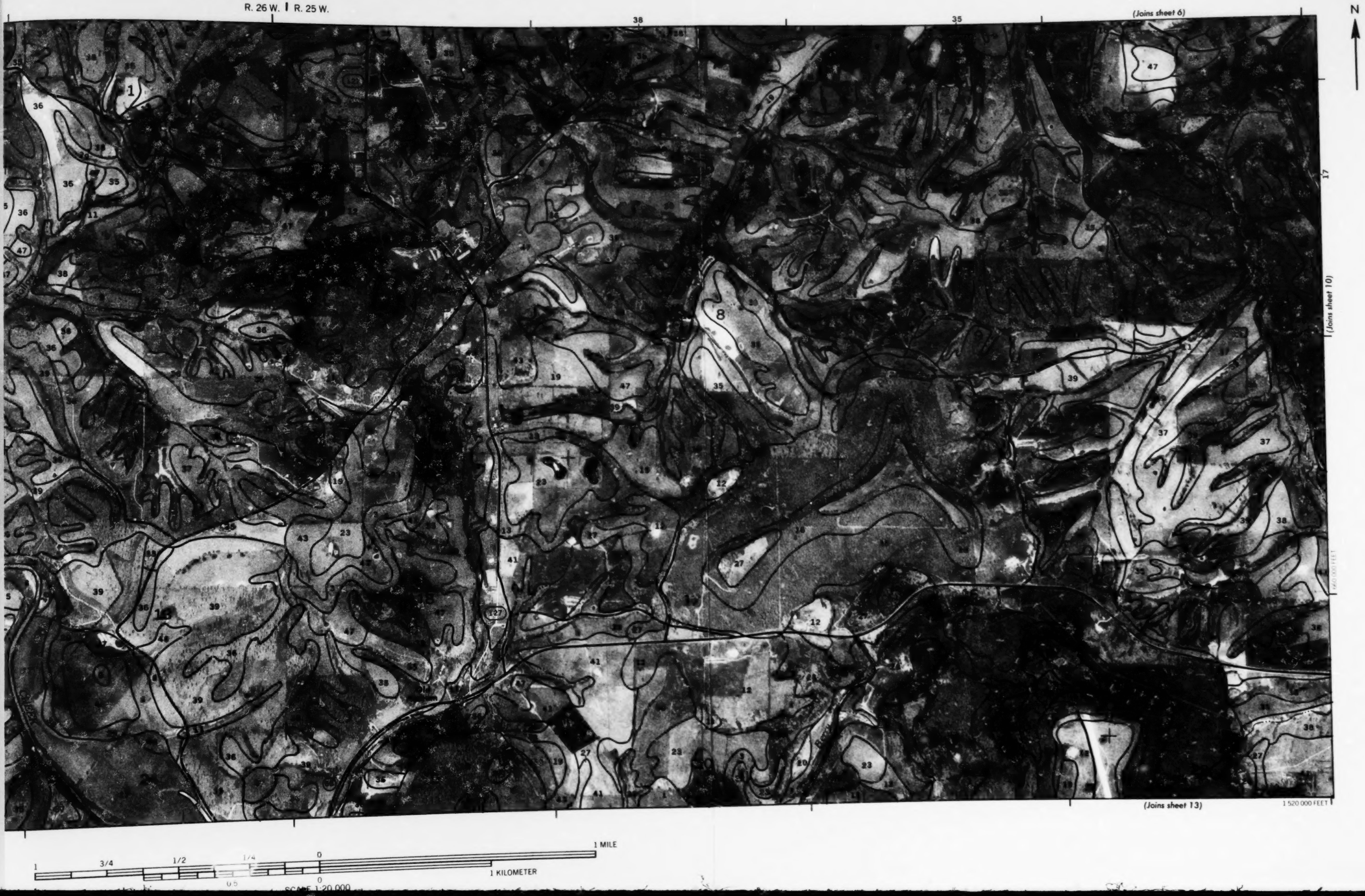

R. 27 W.
R. 26 W.
2 480 000 FEET
T. 17 N.
(Joins sheet 9)
Creek
Glade
Hartwell
Hollow
CREEK
1
2
4
5
6
7
12
13
14
16
17
18
19
20
21
23
24
3/4
1/2
1/4
0
1 MILE

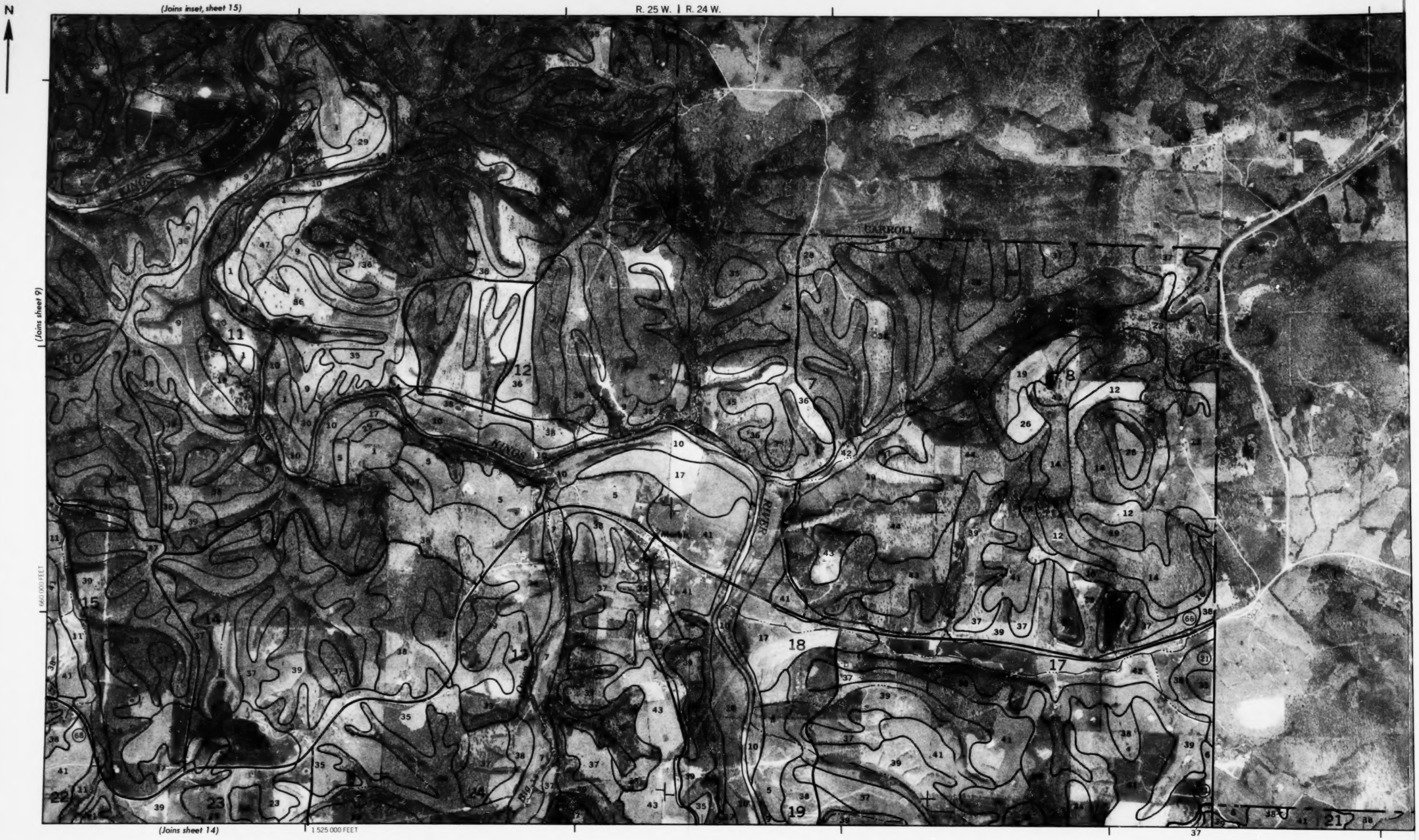

R. 26 W. | R. 25 W.
38
1 485 000 FEET
670 000 FEET
T. 17 N.
(Joins sheet 8)


1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER

SCALE 1:20 000

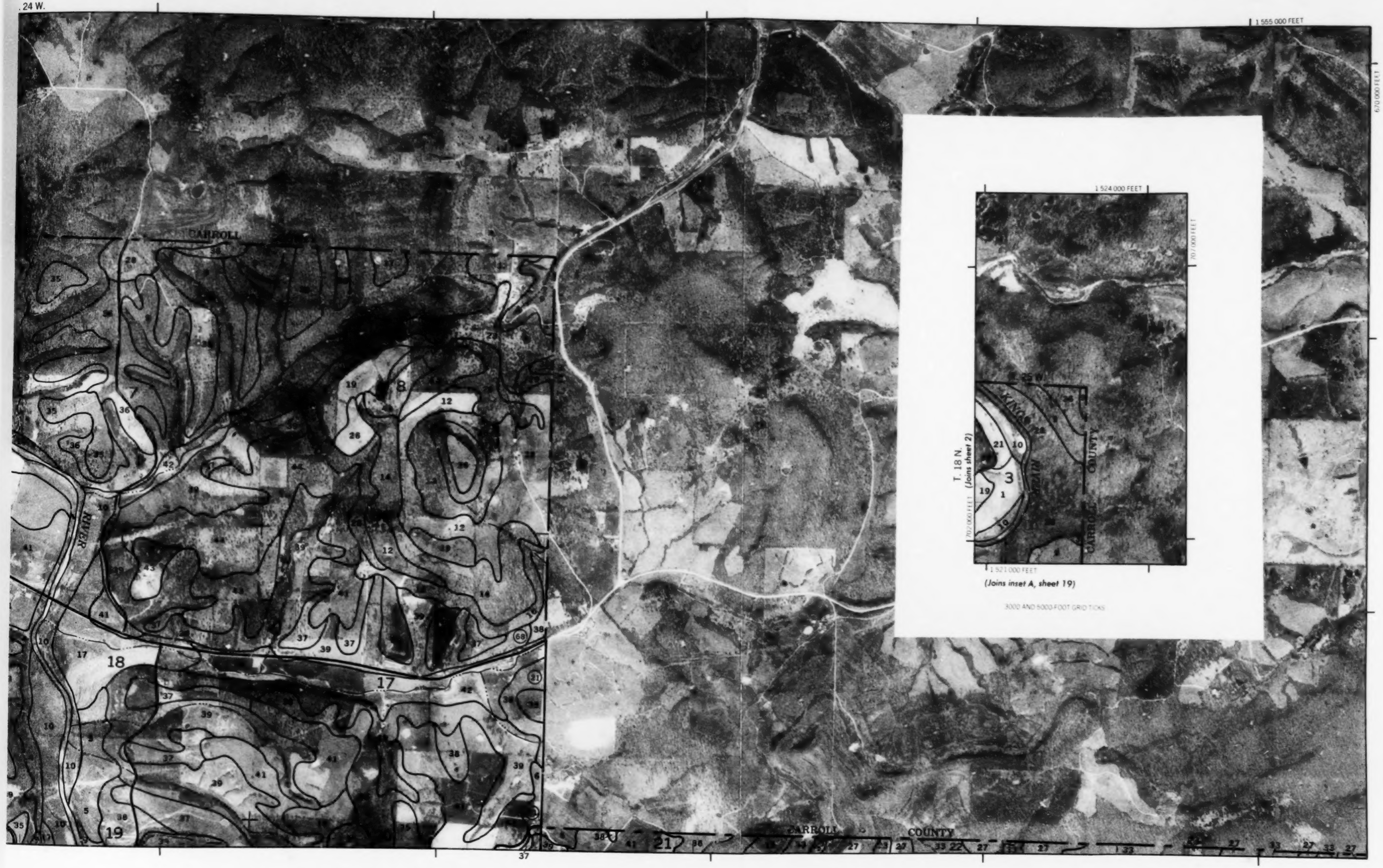
MADISON COUNTY, ARKANSAS — SHEET NUMBER 9


R. 26 W.
R. 25 W.
38
35
(Joins sheet 6)
N
17
(Joins sheet 10)
160 000 FEET
(Joins sheet 13)
1 520 000 FEET
36
35
47
38
8
39
37
12
23
43
41
27
19
127
1
1 MILE
1
3/4
1/2
1/4
0
1 KILOMETER
0.5
0
SCALE 1:20 000


N
(Joins inset, sheet 15)
R. 25 W. | R. 24 W.
(Joins sheet 9)
(Joins sheet 14)
660 000 FEET
1 525 000 FEET
KINGS
KINGS
RIVER
CARROLL
68
21
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER

SCALE 1:20 000

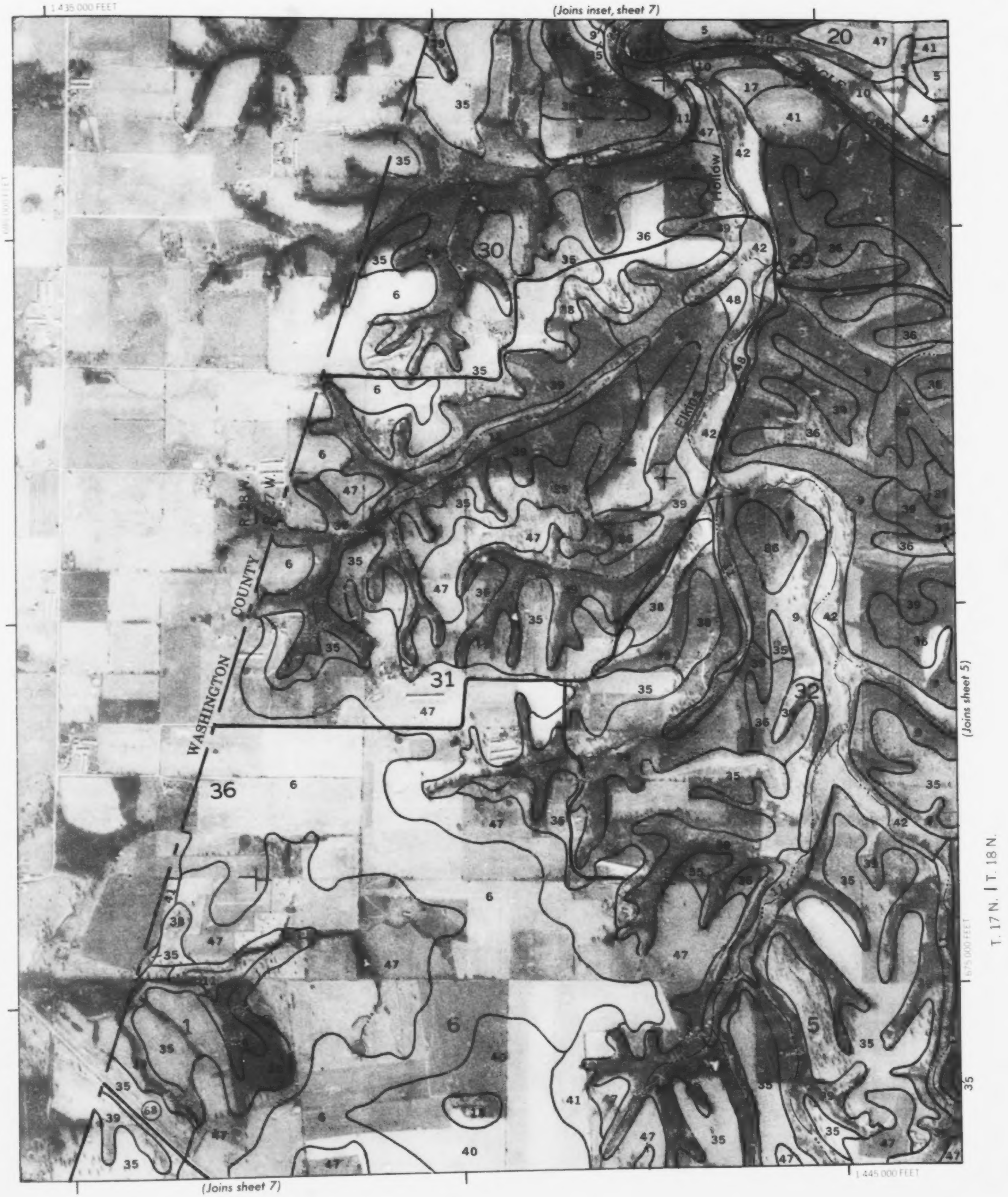
MADISON COUNTY, ARKANSAS — SHEET NUMBER 10

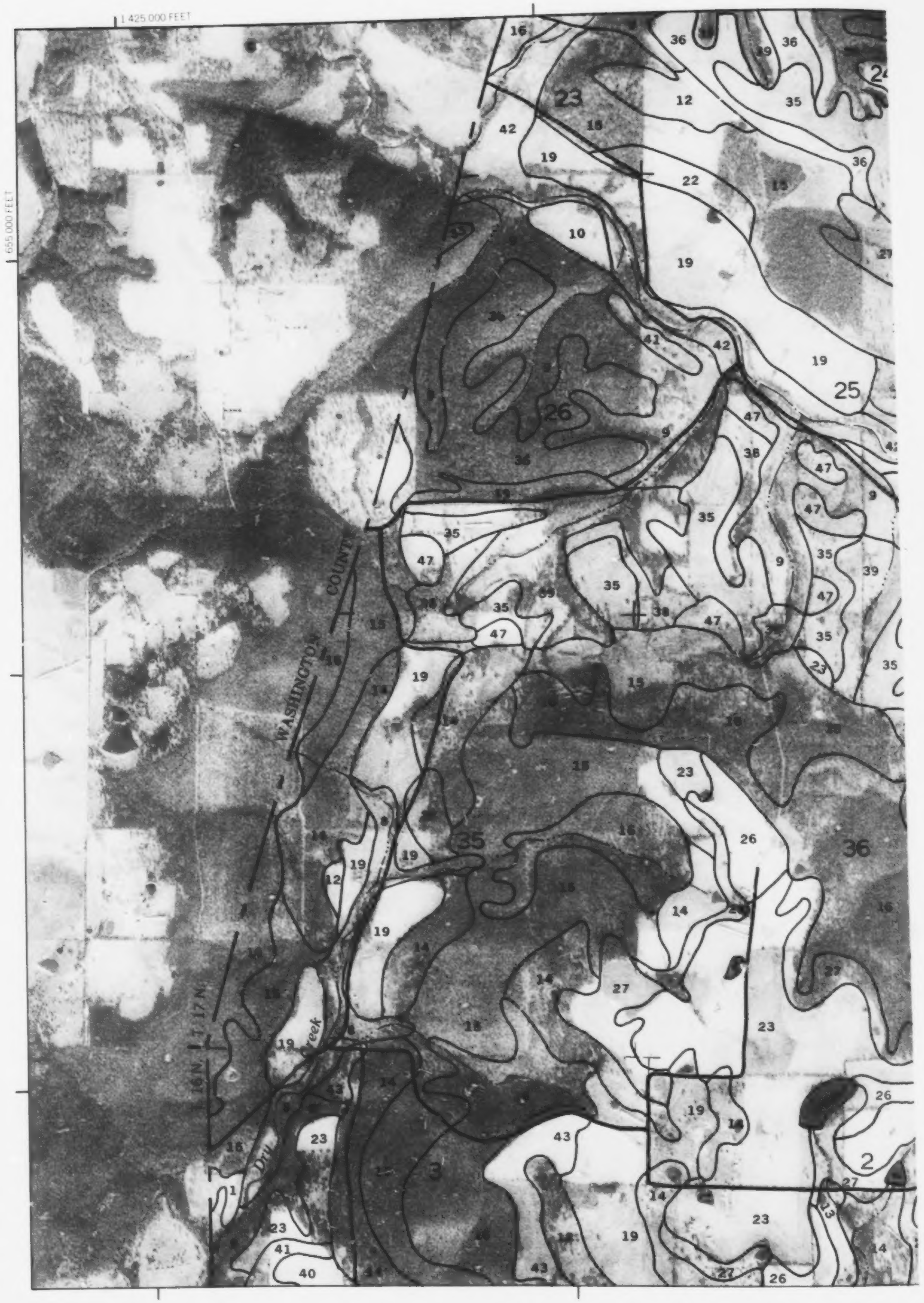

24 W.
1 555 000 FEET
670 000 FEET
CARROLL
RIVER
CARROLL COUNTY
1 524 000 FEET
707 000 FEET
25 W.
KINGS RIVER
CARROLL COUNTY
T. 18 N. (Joins sheet 2)
702 000 FEET
1 521 000 FEET
(Joins inset A, sheet 19)
3000 AND 5000-FOOT GRID TICKS
68
37

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


1 435 000 FEET
(Joins inset, sheet 7)
Hollow
Elkins
R. 28 W.
R. 27 W.
WASHINGTON COUNTY
(Joins sheet 5)
T. 17 N. | T. 18 N.
1 445 000 FEET
(Joins sheet 7)
30
31
32
36
20
29
1
5
6

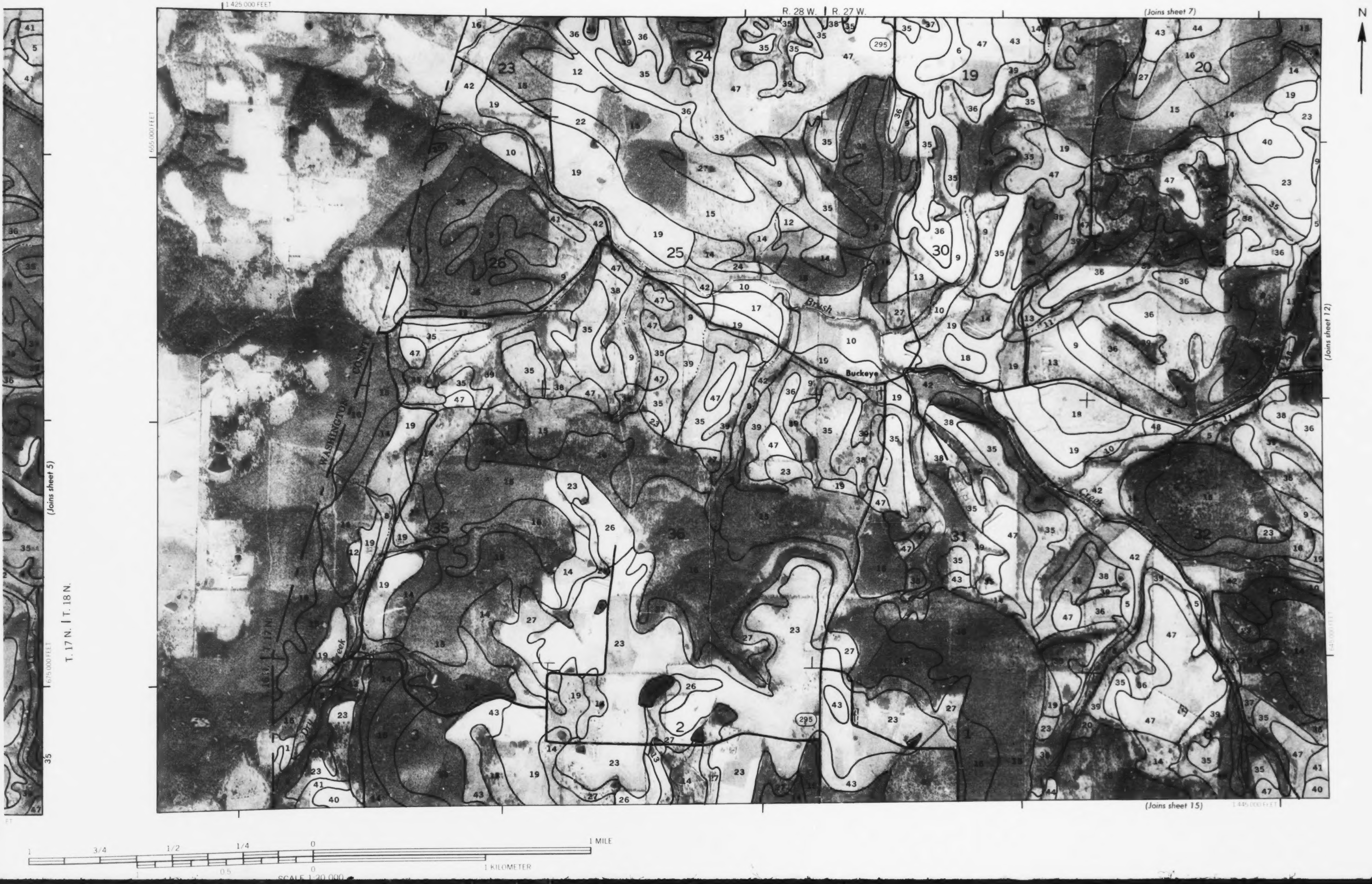

1 425 000 FEET
655 000 FEET
WASHINGTON COUNTY
T. 16 N. | T. 17 N.
Drill Creek
23
25
26
35
36
3
2

1 3/4 1/2 1/4 0 1 MILE

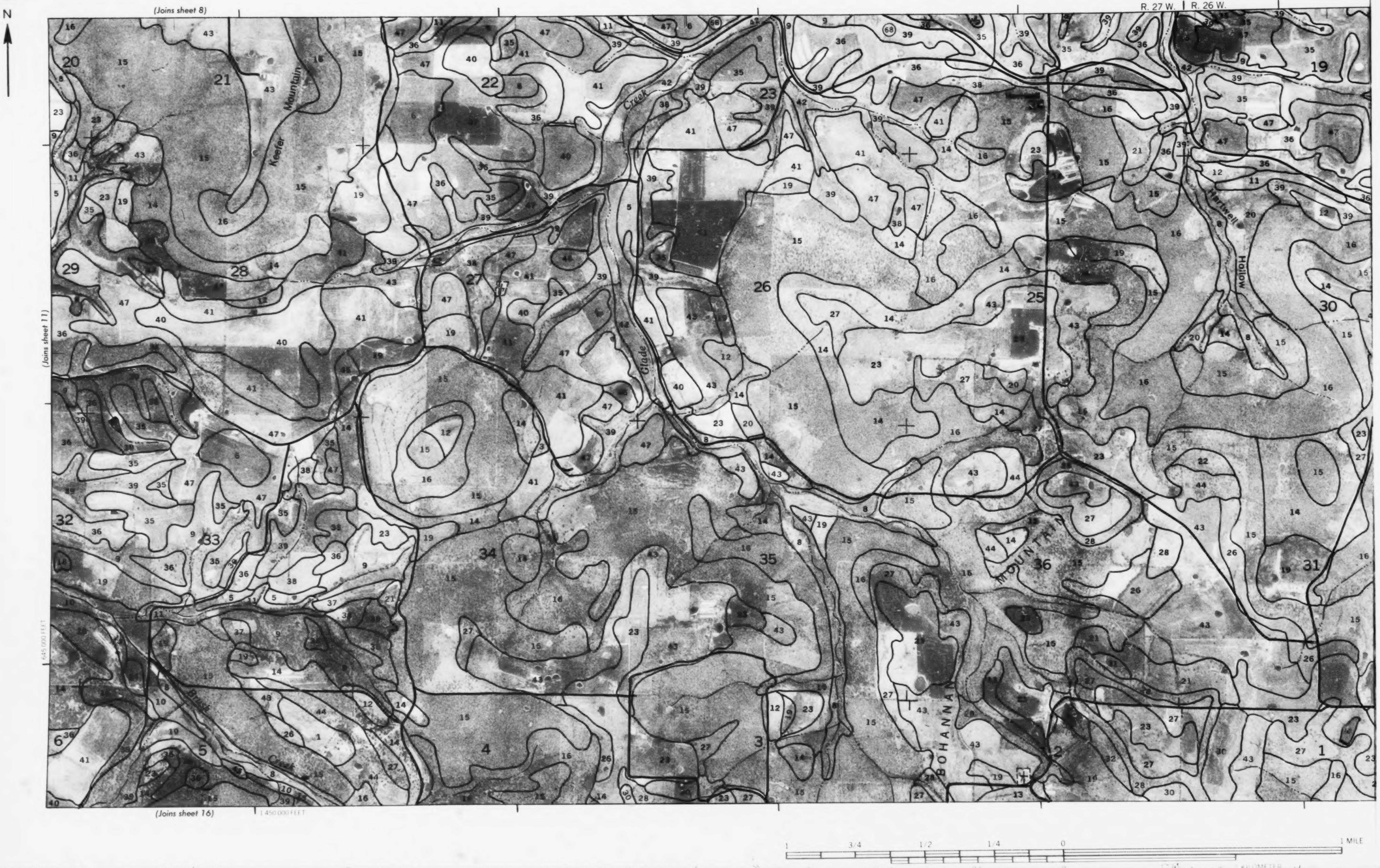
1 0.5 0 1 KILOMETER

SCALE 1:20 000

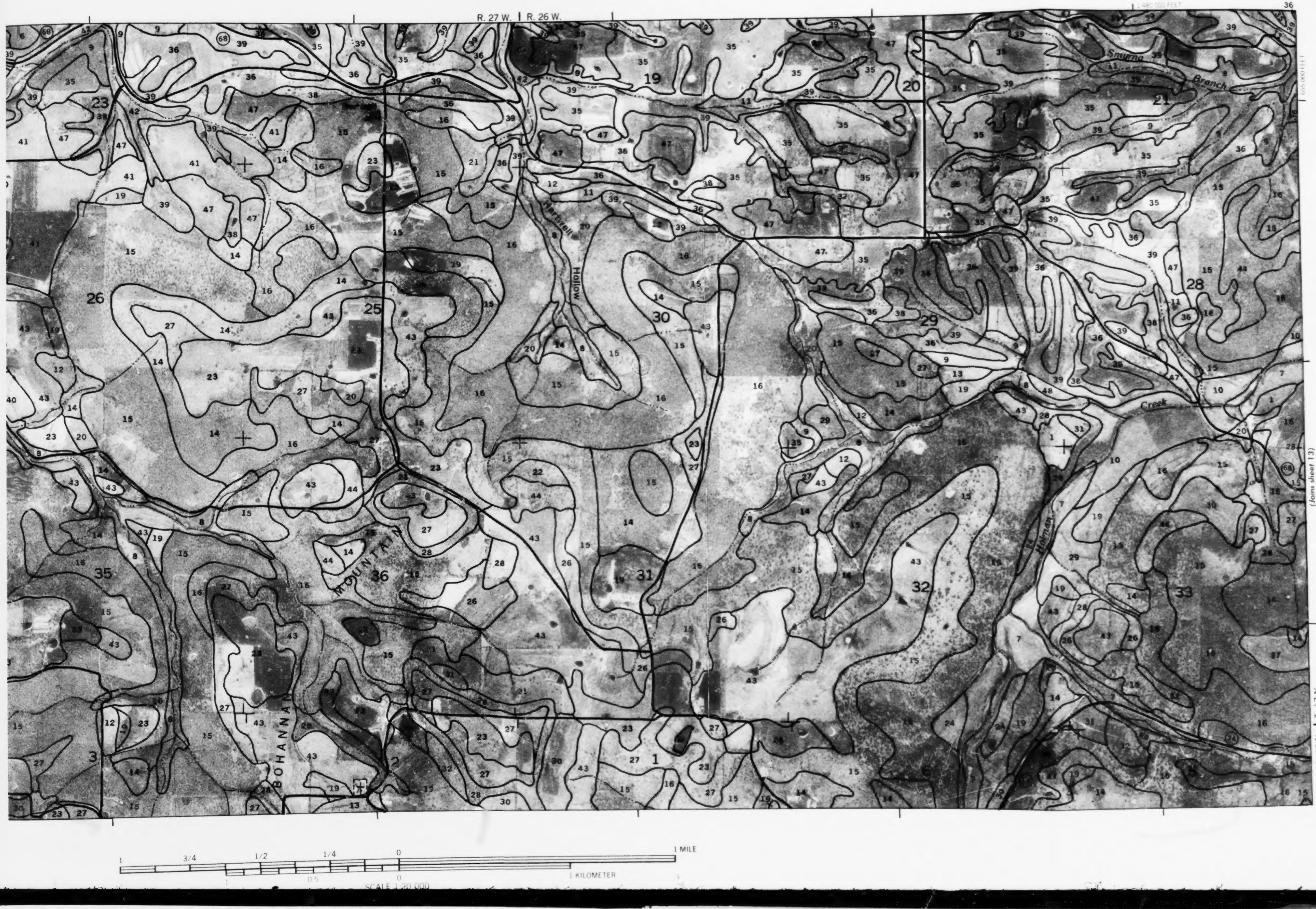
MADISON COUNTY, ARKANSAS — SHEET NUMBER 11

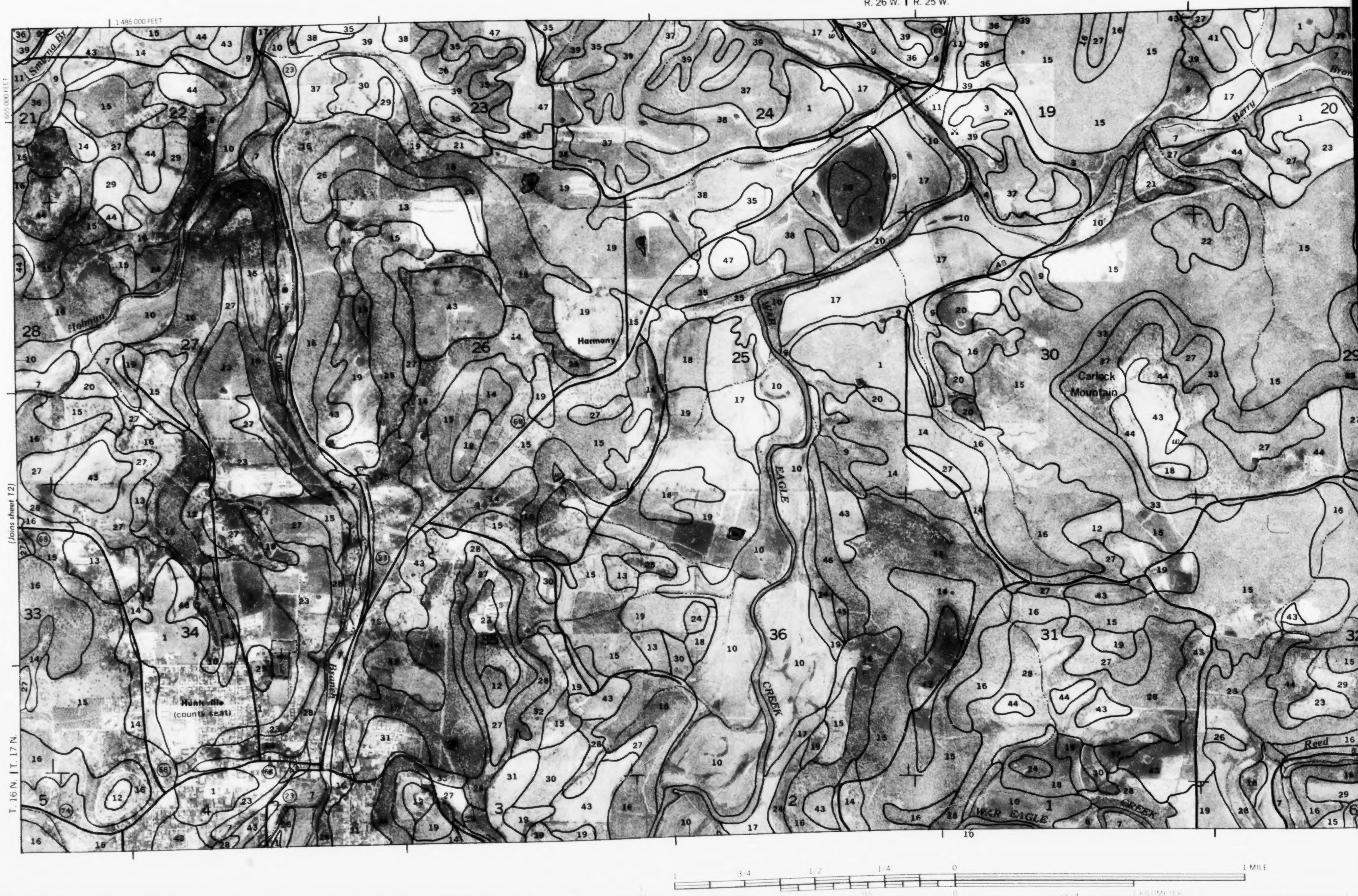

N
1 425 000 FEET
R. 28 W.
R. 27 W.
(Joins sheet 7)
(Joins sheet 12)
(Joins sheet 15)
(Joins sheet 5)
655 000 FEET
675 000 FEET
1 445 000 FEET
T. 17 N. | T. 18 N.
Brush
Creek
Buckeye
WASHINGTON
COUNTY
Dry
Creek
295
1 MILE
3/4
1/2
1/4
0
0.5
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 12

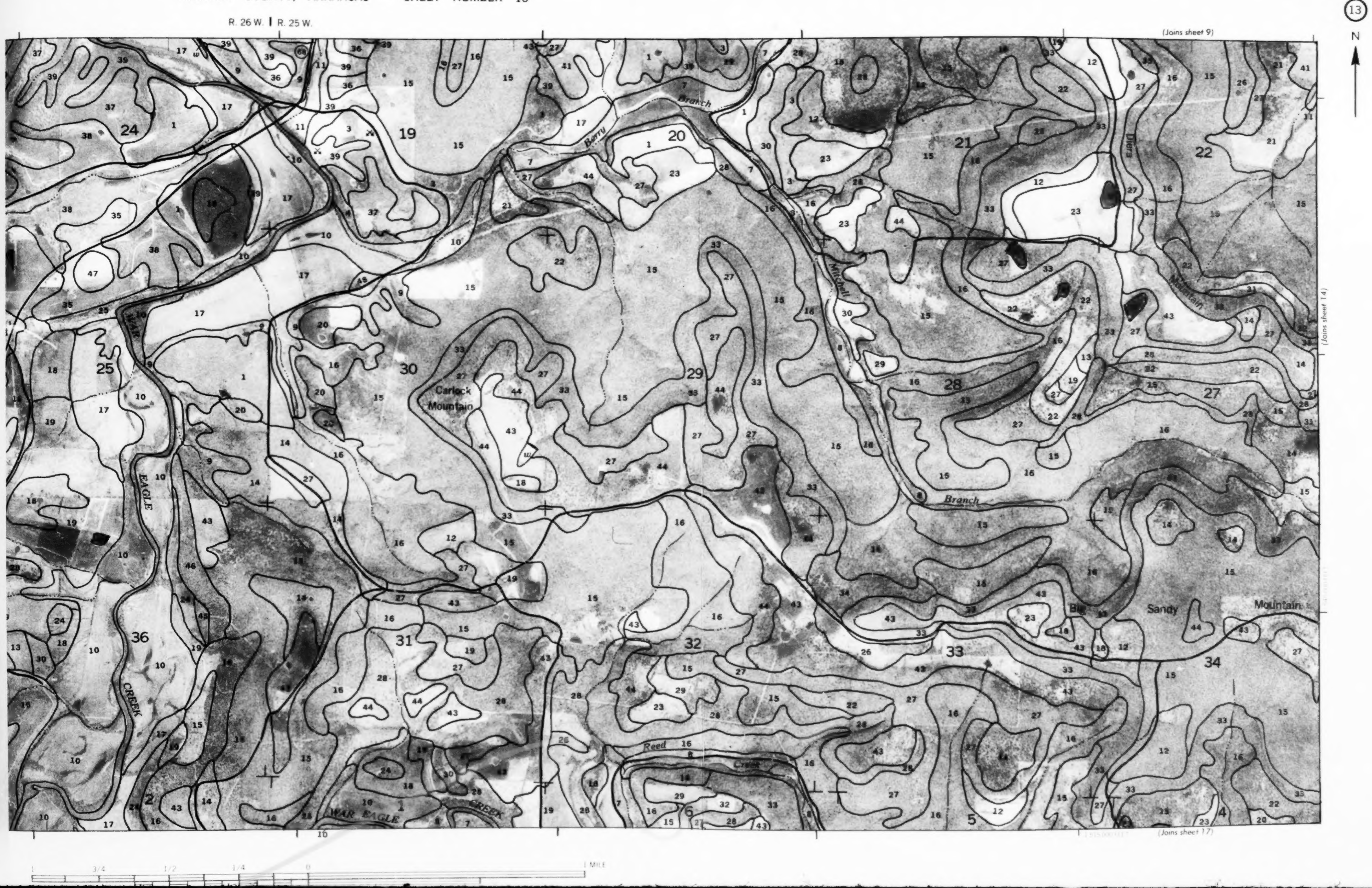

N
(Joins sheet 8)
R. 27 W.
R. 26 W.
(Joins sheet 11)
(Joins sheet 16)
Keefer Mountain
Glade Creek
Hartwell Hollow
Brush Creek
BOHANNAN MOUNTAIN
645 000 FEET
1 450 000 FEET
1
3/4
1/2
1/4
0
1 MILE
KILOMETER

MADISON COUNTY, ARKANSAS — SHEET NUMBER 12

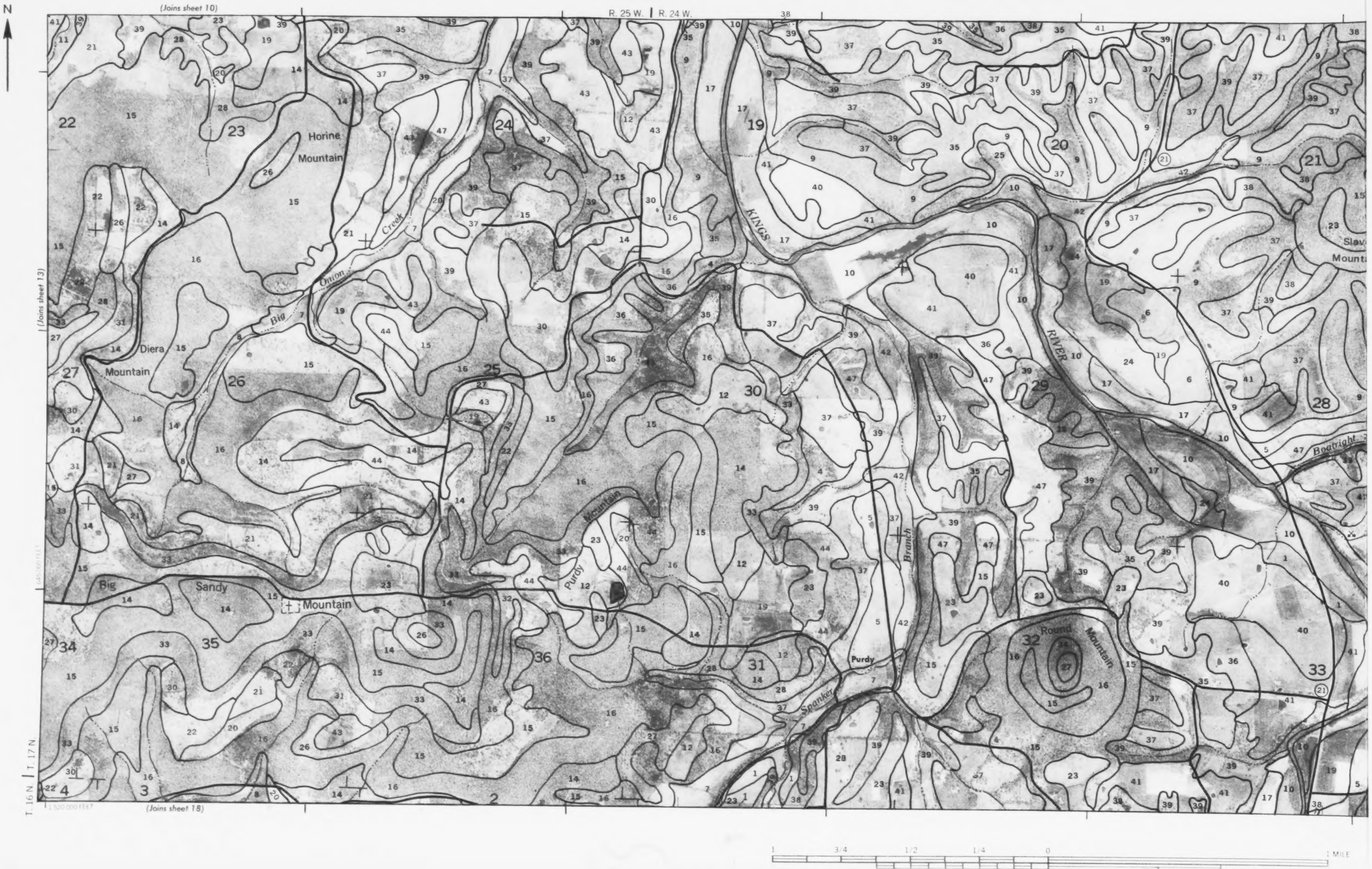

R. 27 W.
R. 26 W.
1 480 000 FEET
655 000 FEET
36
19
20
21
23
25
26
28
29
30
31
32
33
35
36
1
2
3
Smyrna Branch
Hartwell Hollow
Creek
Holman
BOHANNAN MOUNTAIN
(Joins sheet 13)
T. 16 N.
T. 17 N.
1 MILE
3/4
1/2
1/4
0
1
1 KILOMETER
0.5
SCALE 1:20 000


R. 26 W. | R. 25 W.
1 485 000 FEET
695 000 FEET
(Joins sheet 12)
T. 16 N. | T. 17 N.
Harmony
Huntsville
(county seat)
Carlock Mountain
Holman
Smyrna Br.
Berry
Branch
WAR EAGLE
EAGLE CREEK
WAR EAGLE CREEK
Reed
10
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
SCALE 1:20 000

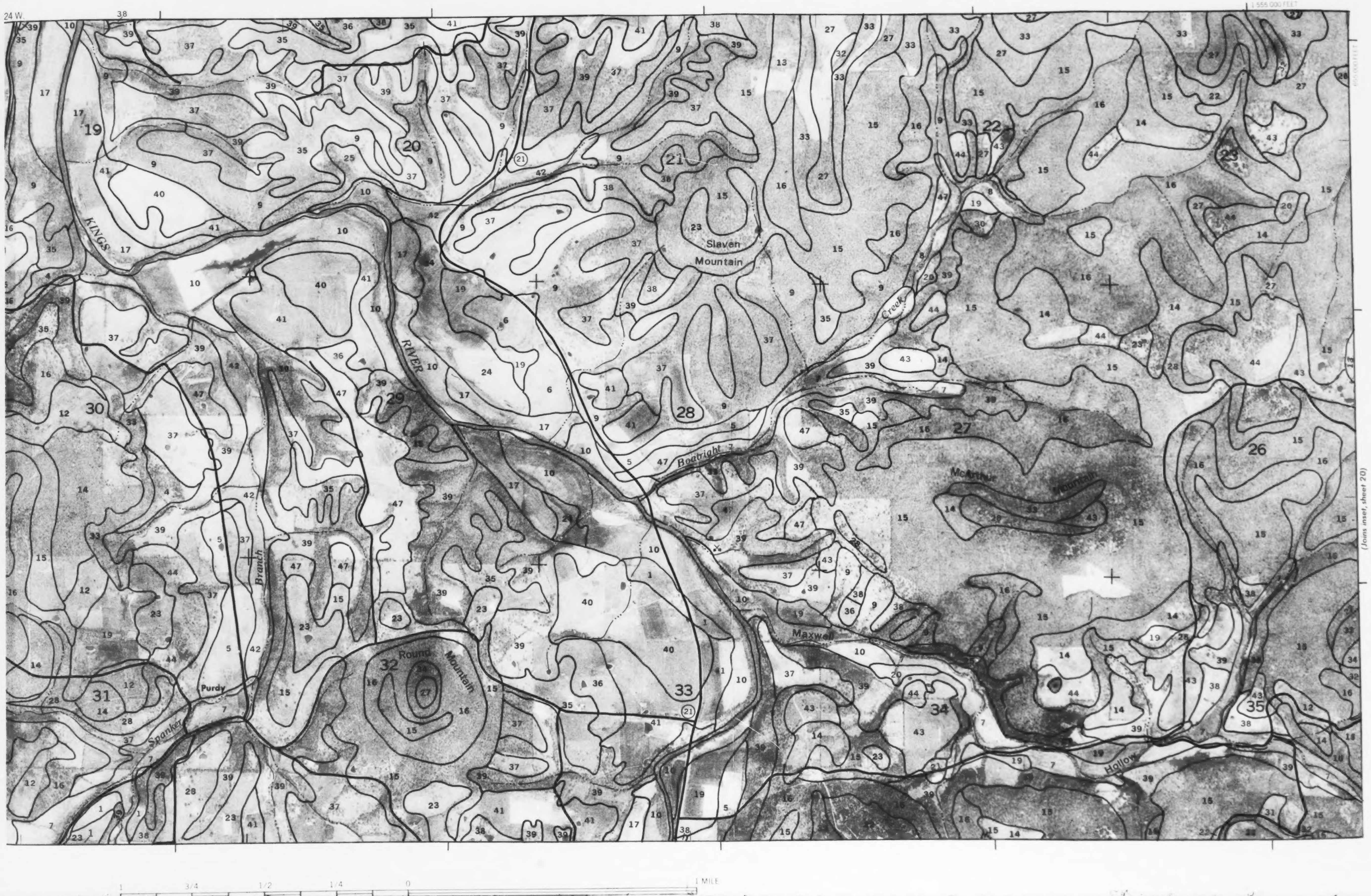
MADISON COUNTY, ARKANSAS — SHEET NUMBER 13

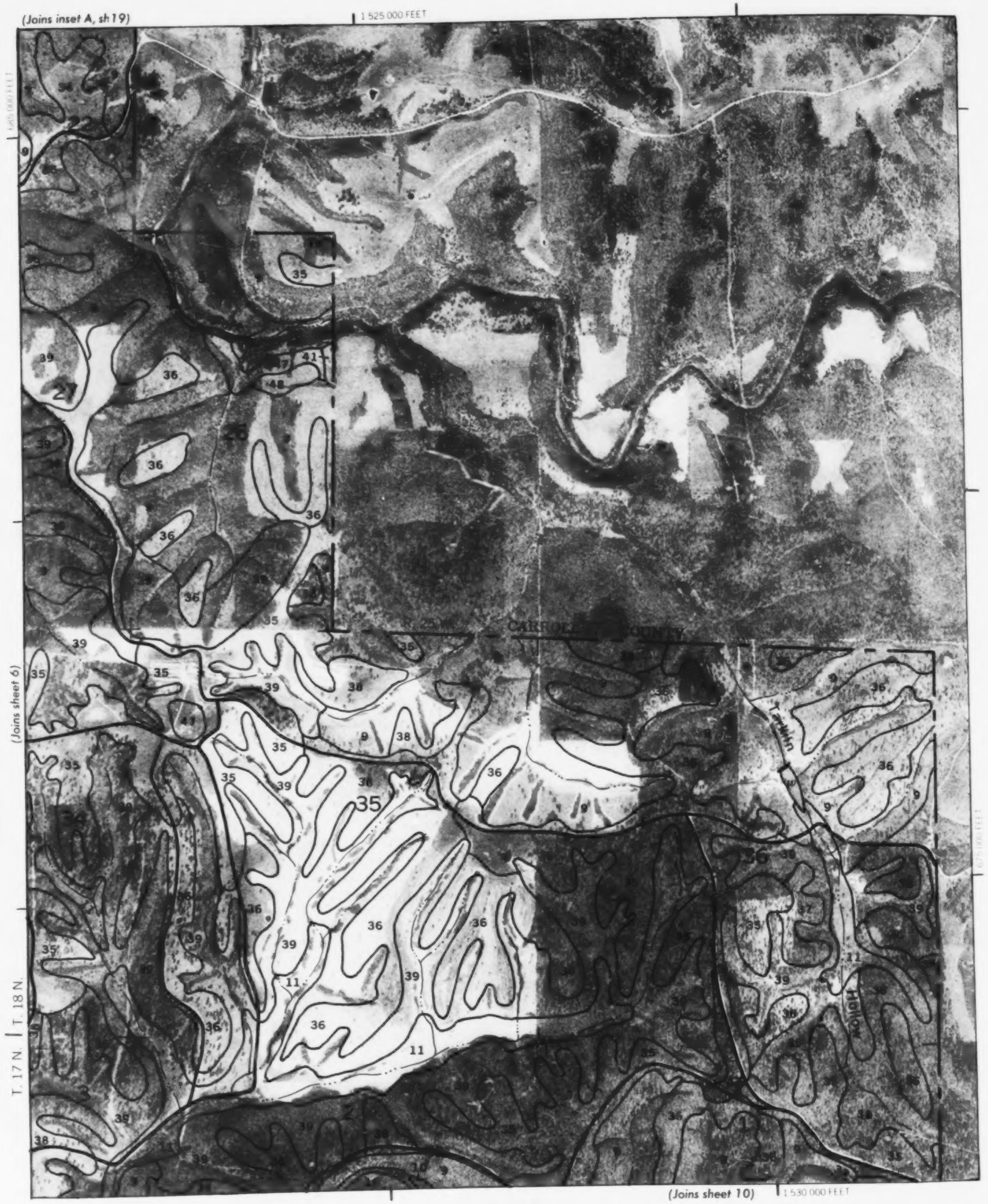


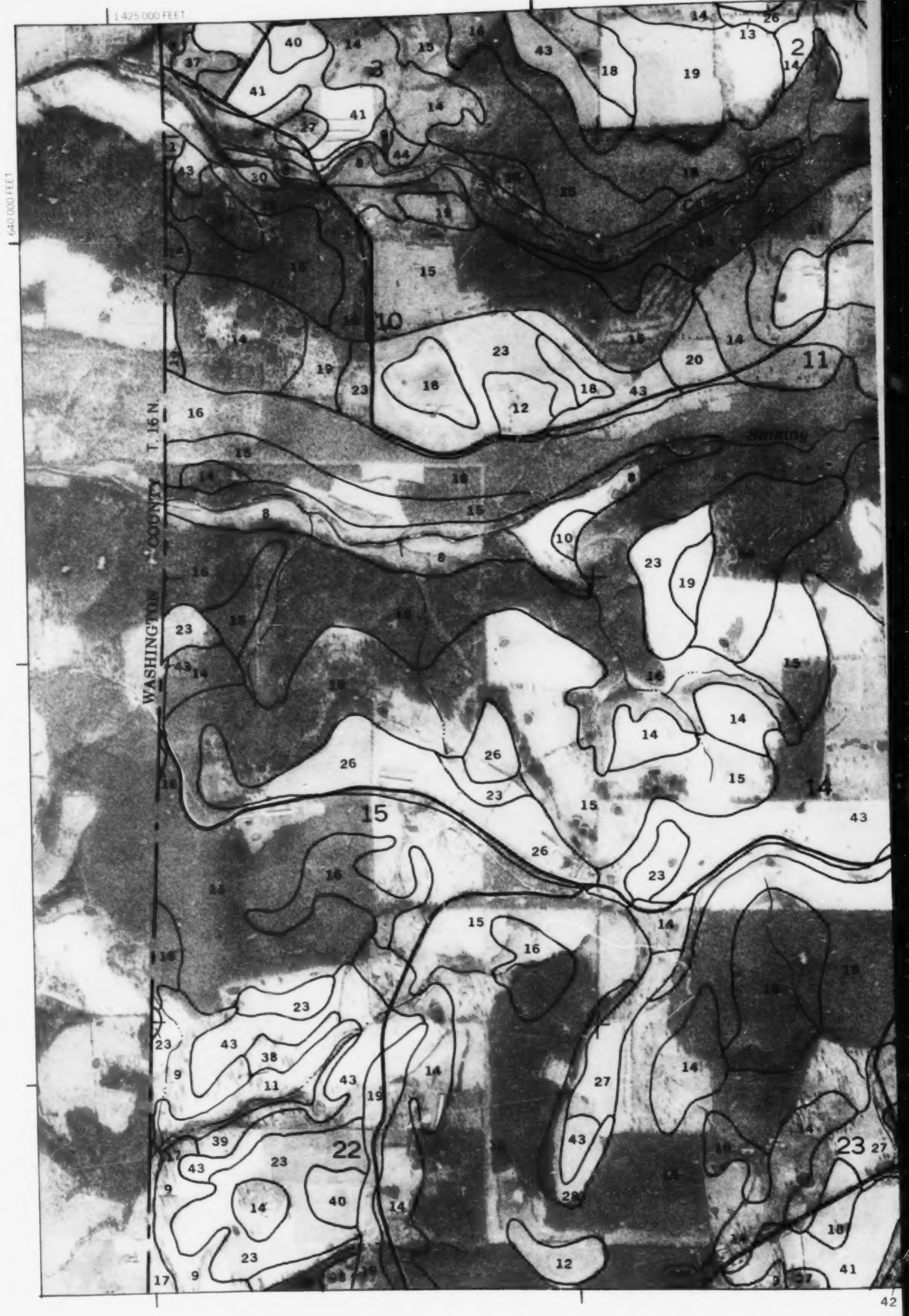
13
N
R. 26 W.
R. 25 W.
(Joins sheet 9)
(Joins sheet 14)
(Joins sheet 17)
Barry Branch
Mitchell Branch
Mountain
Carlock Mountain
War Eagle Creek
Reed Creek
Big Sandy Mountain
19
20
21
22
24
25
28
29
30
31
32
33
34
36
1
2
4
5
6
1 3/4 1/2 1/4 0 1 MILE


N
(Joins sheet 10)
R. 25 W. | R. 24 W.
(Joins sheet 13)
(Joins sheet 18)
T. 16 N. | T. 17 N.
Horine Mountain
Diera Mountain
Big Onion Creek
KINGS RIVER
Purdy Mountain
Branch
Purdy
Spanker
Big Sandy Mountain
Round Mountain
Boatright
Slove Mounta
21
1 520 000 FEET
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
19
20
21
2
3
4
1
3/4
1/2
1/4
0
1 MILE

MADISON COUNTY, ARKANSAS — SHEET NUMBER 14


24 W.
1 555 000 FEET
KINGS RIVER
Slaven Mountain
Creek
Bogbright
McArthur Mountain
Branch
Round Mountain
Purdy
Spanker
Maxwell
Hollow
21
(Joins inset, sheet 20)
1
3/4
1/2
1/4
0
1 MILE


(Joins inset A, sh19)
1 525 000 FEET
585 000 FEET
(Joins sheet 6)
CARROLL COUNTY
T. 18 N
T. 17 N
(Joins sheet 10)
1 530 000 FEET
35
36
39
9
11
27
26
41
48

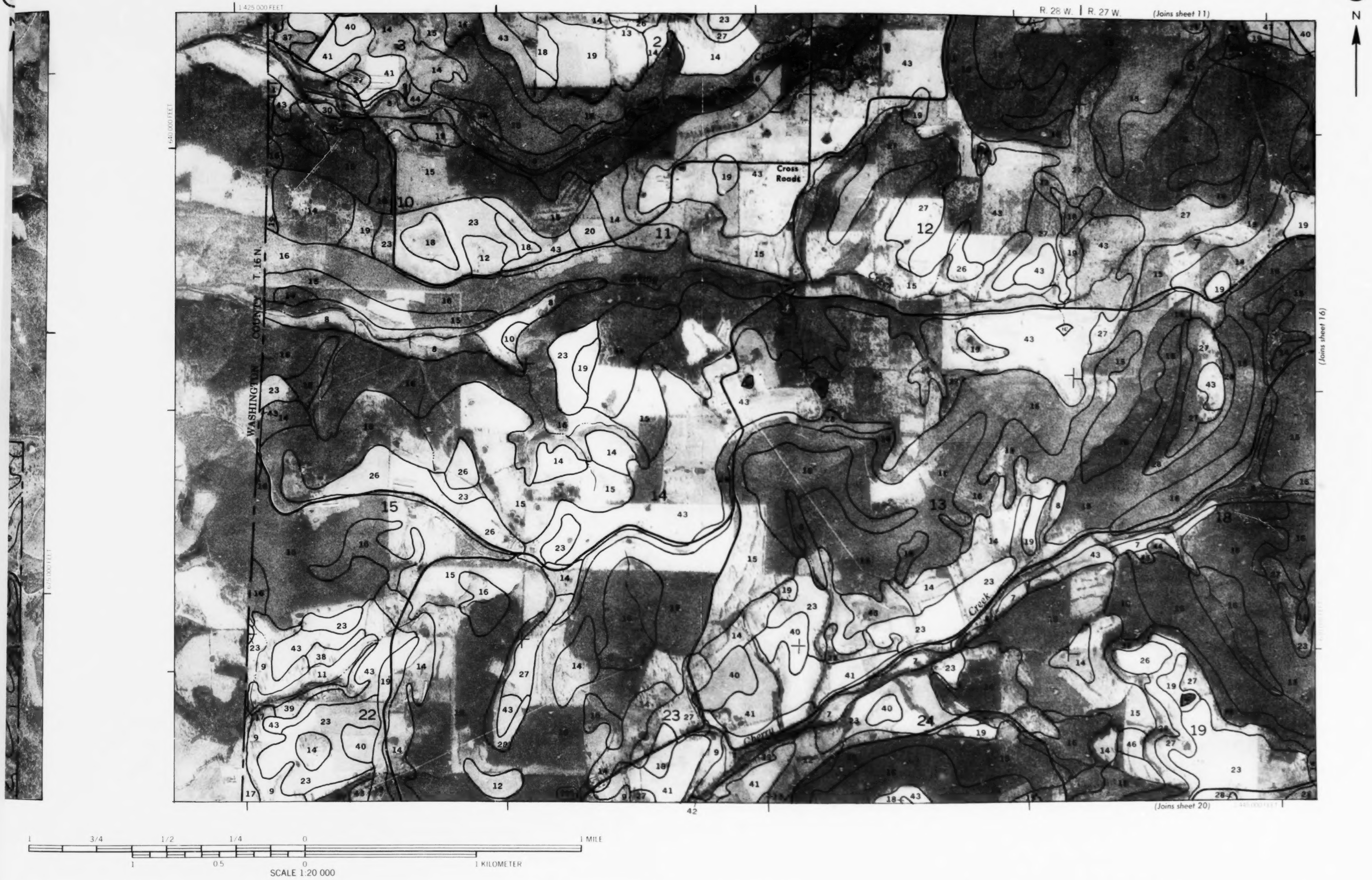

1 425 000 FEET
640 000 FEET
WASHINGTON COUNTY
T. 16 N.
Kings
10
11
15
14
22
23
2
3
42

1 3/4 1/2 1/4 0 1 MILE

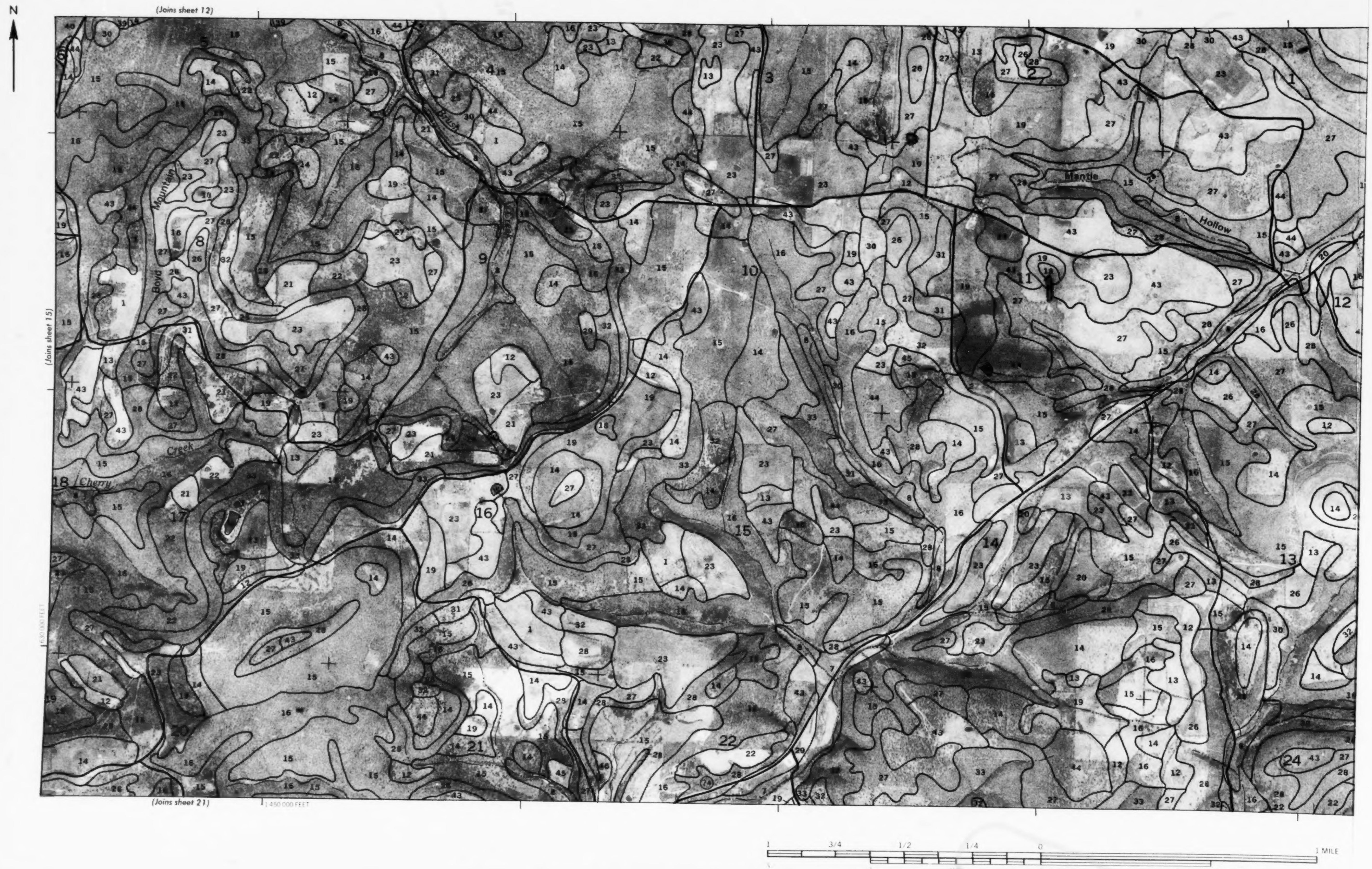
1 0.5 0 1 KILOMETER

SCALE 1:20 000

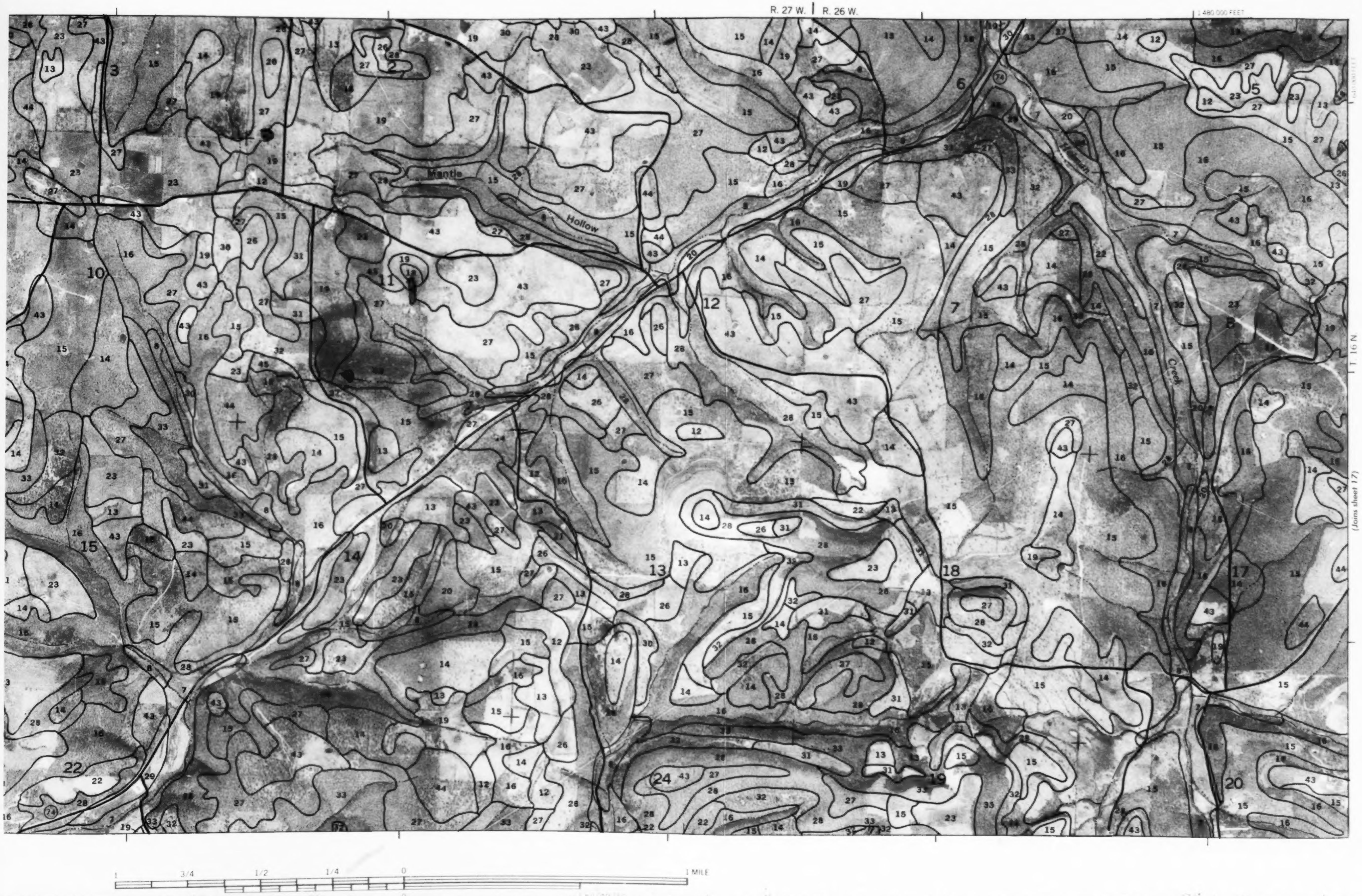
MADISON COUNTY, ARKANSAS — SHEET NUMBER 15

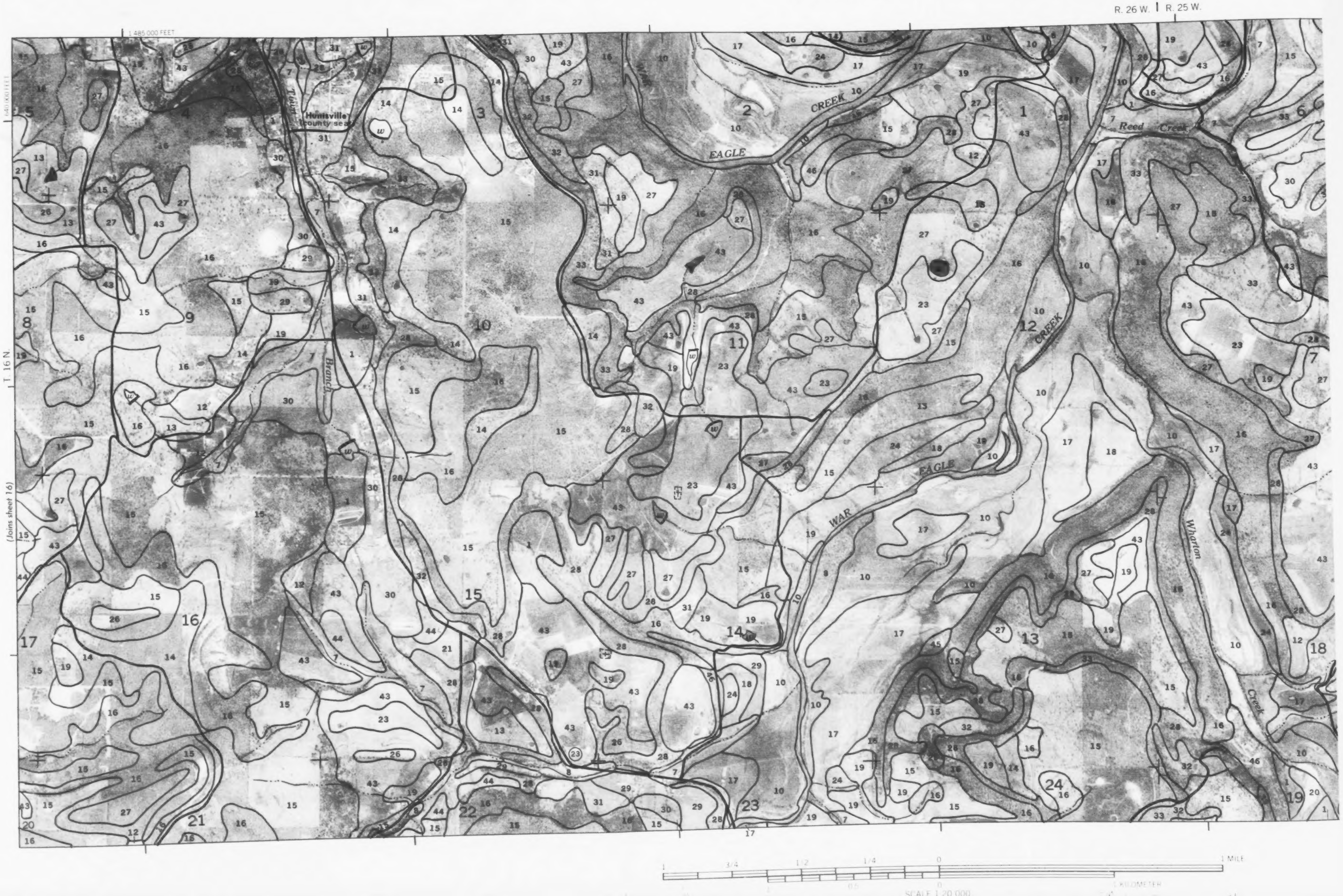

1 425 000 FEET
R. 28 W.
R. 27 W.
(Joins sheet 11)
(Joins sheet 16)
(Joins sheet 20)
N
Cross Roads
WASHINGTON COUNTY
T. 16 N.
Cherry
Creek
2
3
10
11
12
7
13
14
15
18
22
23
24
19
42
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER

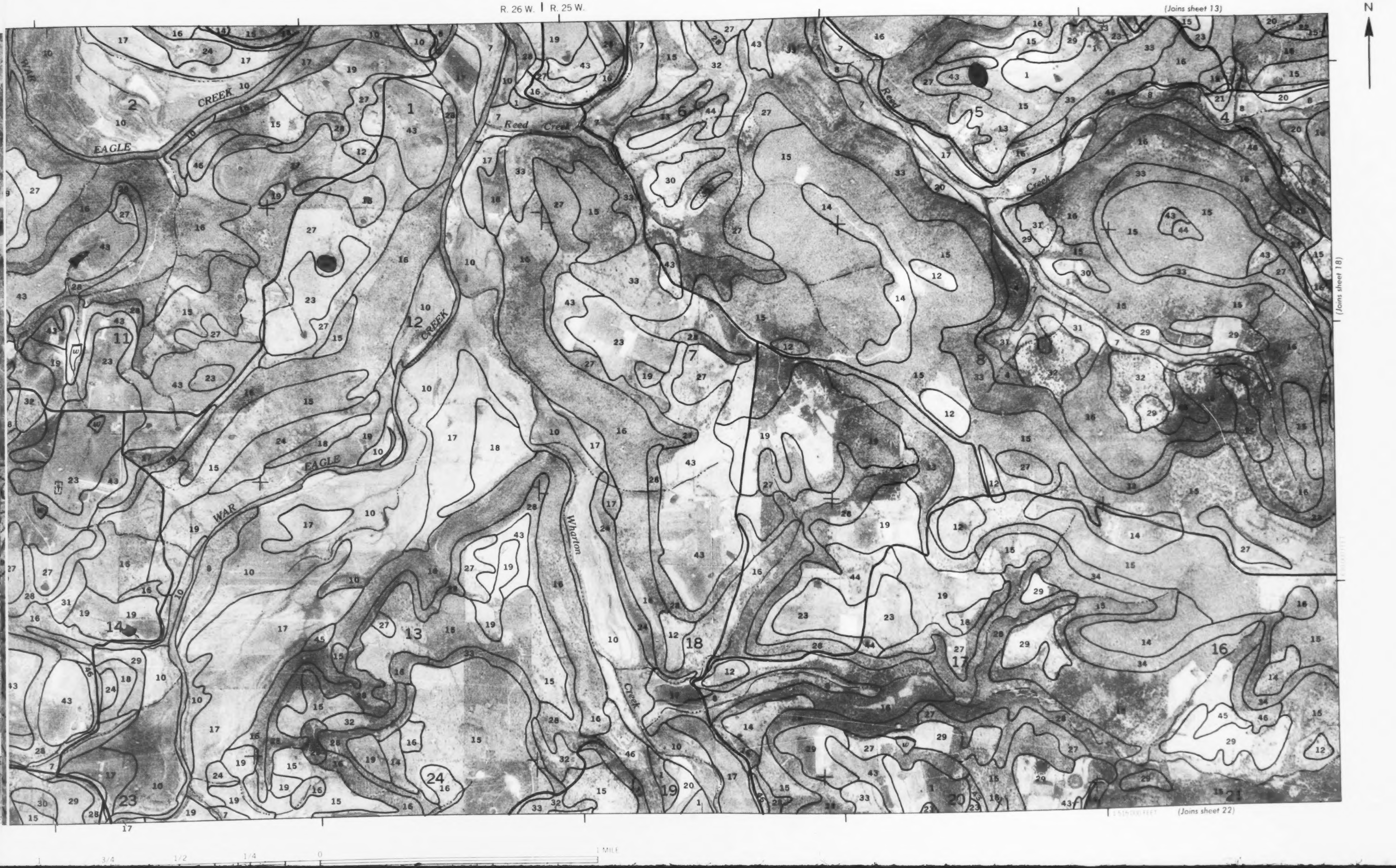
SCALE 1:20 000


N
(Joins sheet 12)
(Joins sheet 15)
(Joins sheet 21)
Boyd
Mountain
Brush
Cherry
Creek
Mantle
Hollow
1 450 000 FEET
1
3/4
1/2
1/4
0
1 MILE

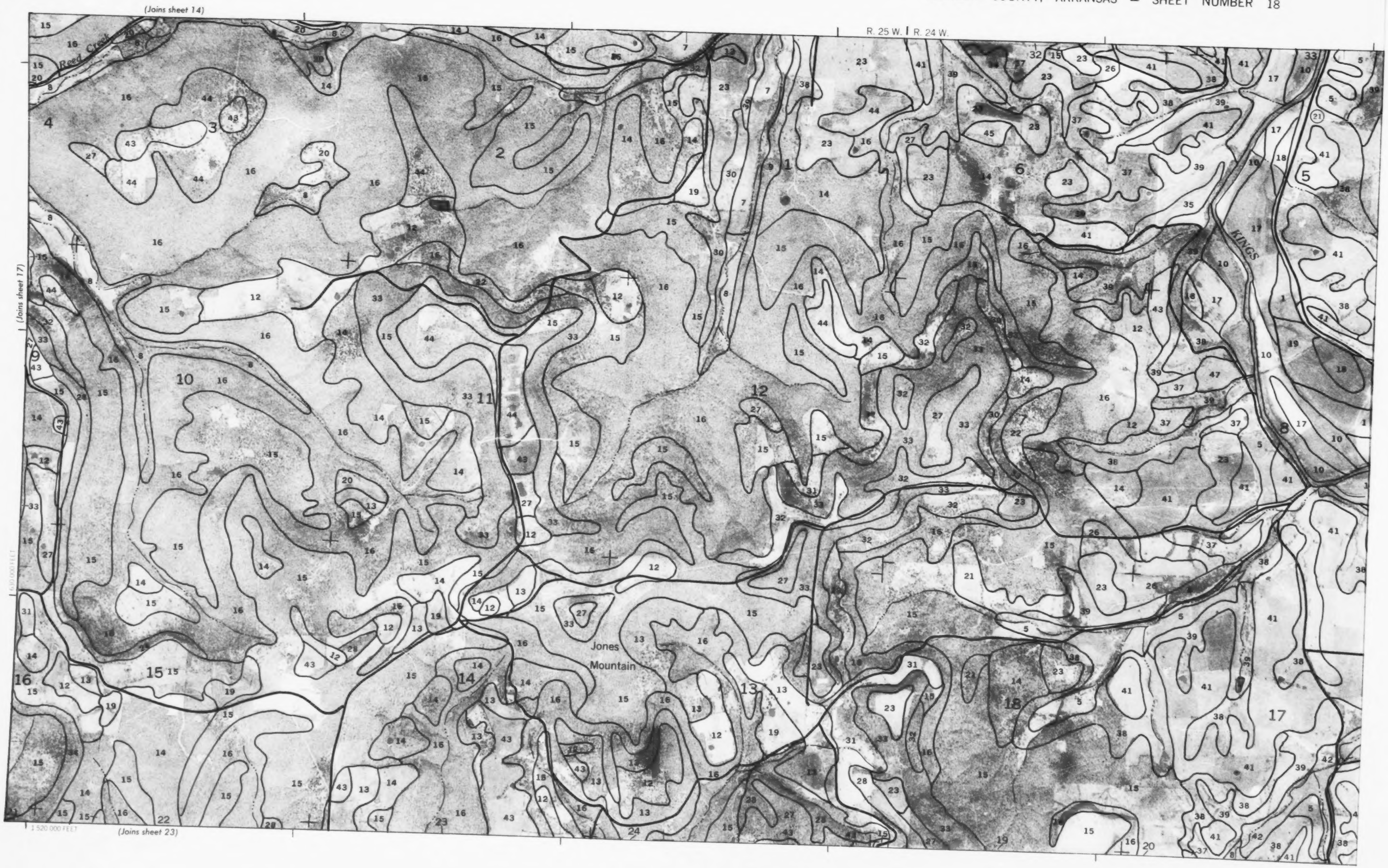
MADISON COUNTY, ARKANSAS — SHEET NUMBER 16


R. 27 W.
R. 26 W.
1 480 000 FEET
T. 16 N.
(Joins sheet 17)
Mantle
Hollow
Creek
1
3/4
1/2
1/4
0
1 MILE

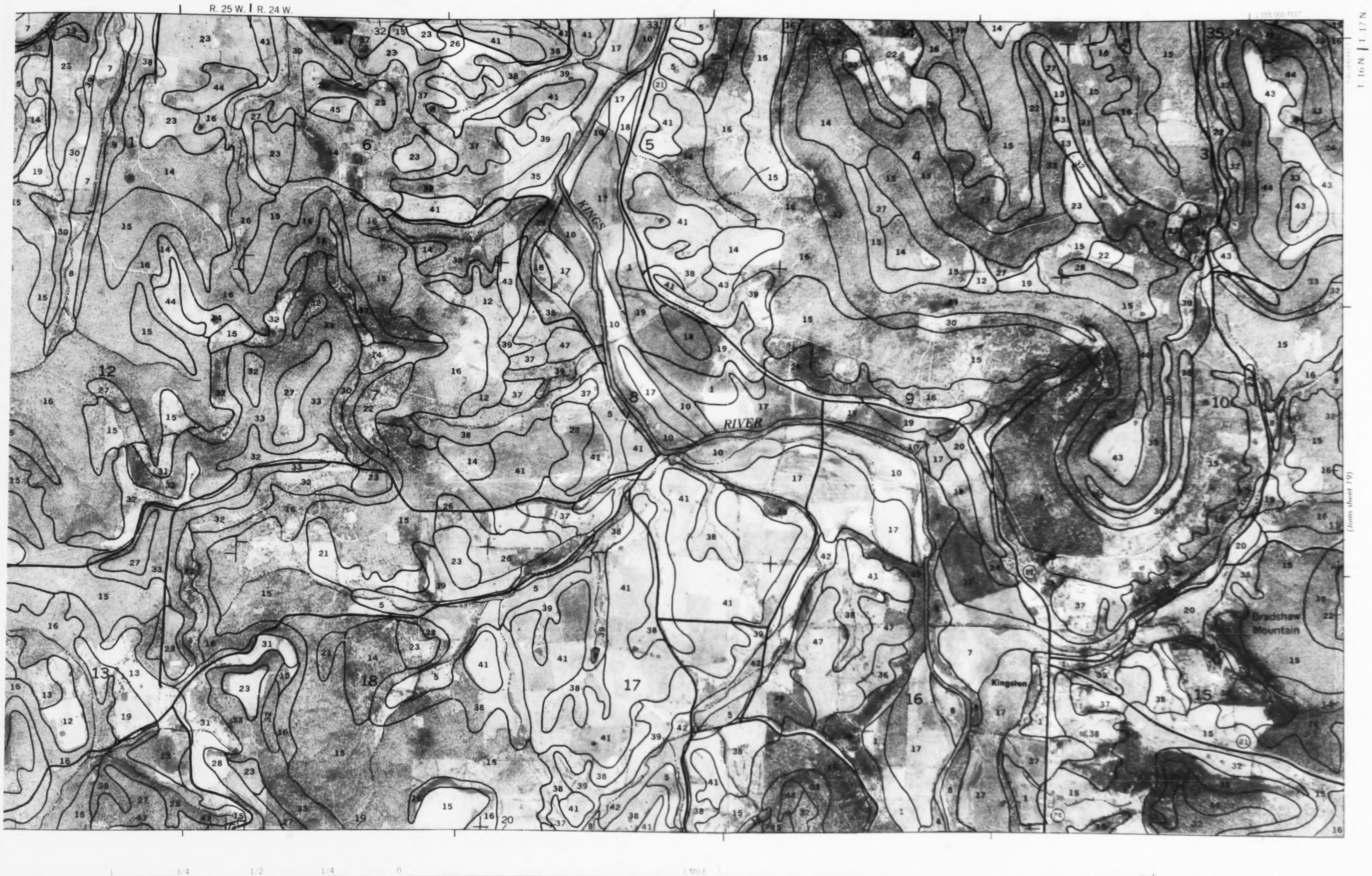

R. 26 W.
R. 25 W.
1 485 000 FEET
T. 16 N.
(Joins sheet 16)
Huntsville (county seat)
Town Branch
EAGLE CREEK
Reed Creek
WAR EAGLE CREEK
Wharton Creek
17
1
3/4
1/2
1/4
0
1 MILE
0.5
0
1 KILOMETER
SCALE 1:20 000

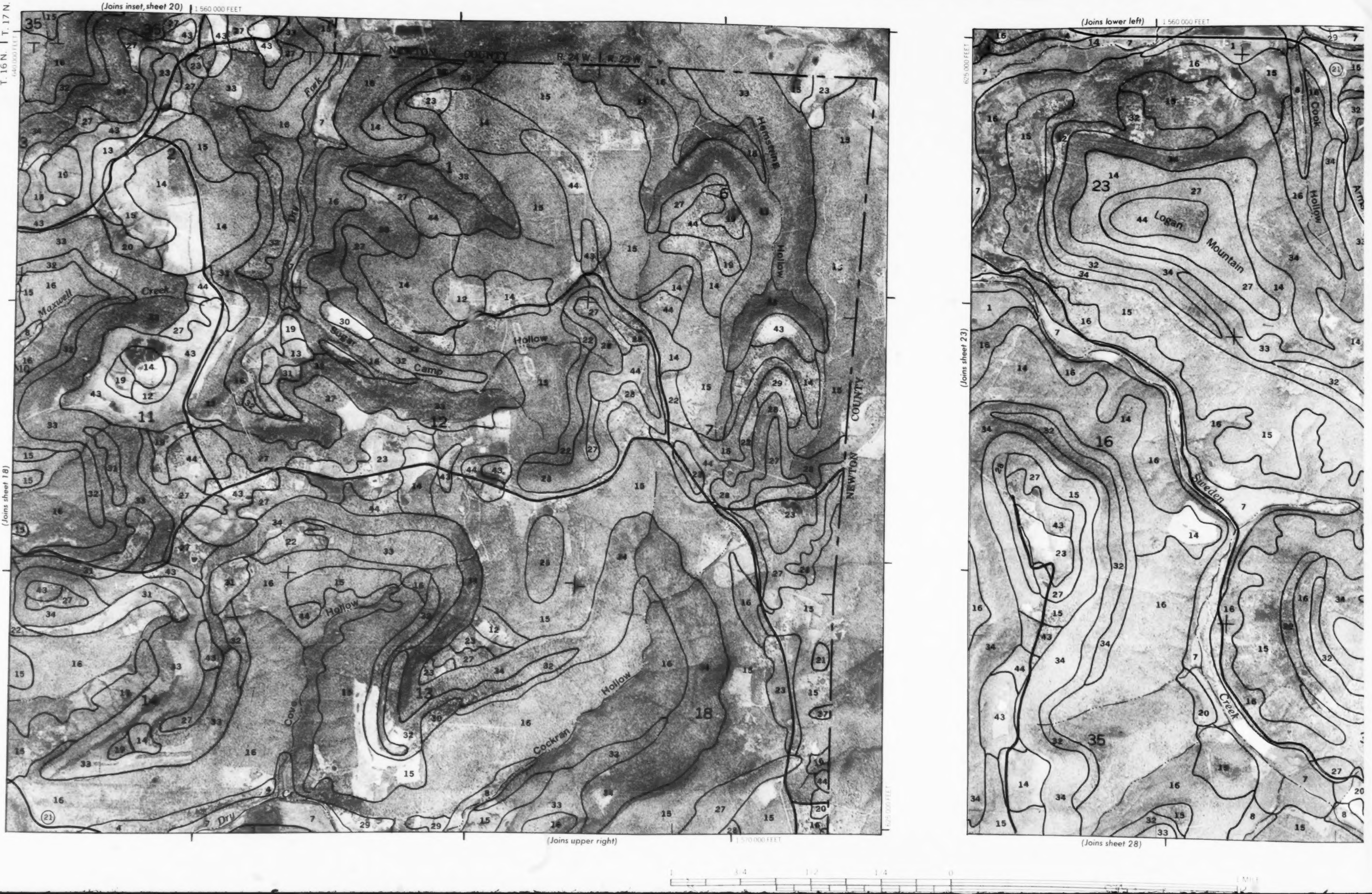

R. 26 W.
R. 25 W.
(Joins sheet 13)
(Joins sheet 18)
(Joins sheet 22)
N
WAR
EAGLE
CREEK
Reed
Creek
Wharton
Creek
1
3/4
1/2
1/4
0
1 MILE

MADISON COUNTY, ARKANSAS — SHEET NUMBER 18


N
(Joins sheet 14)
(Joins sheet 17)
(Joins sheet 23)
R. 25 W. | R. 24 W.
Reed Creek
KINGS
Jones Mountain
1 520 000 FEET
630 000 FEET

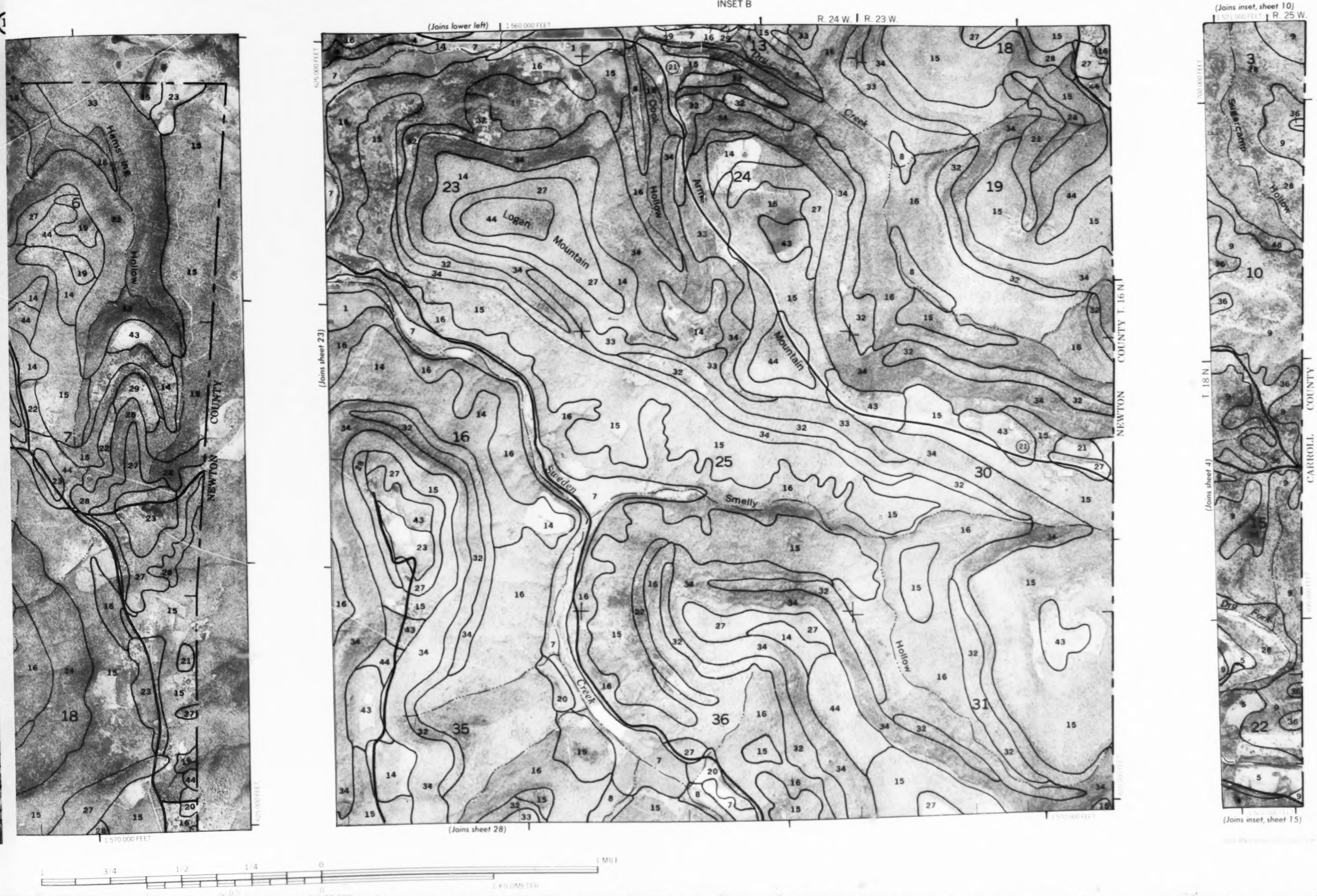
MADISON COUNTY, ARKANSAS — SHEET NUMBER 18


R. 25 W. | R. 24 W.
T. 17 N. | T. 16 N.
KINGS
RIVER
Kingston
Bradshaw Mountain
(Joins sheet 19)
21
74
1 3/4 1/2 1/4 0 1 MILE

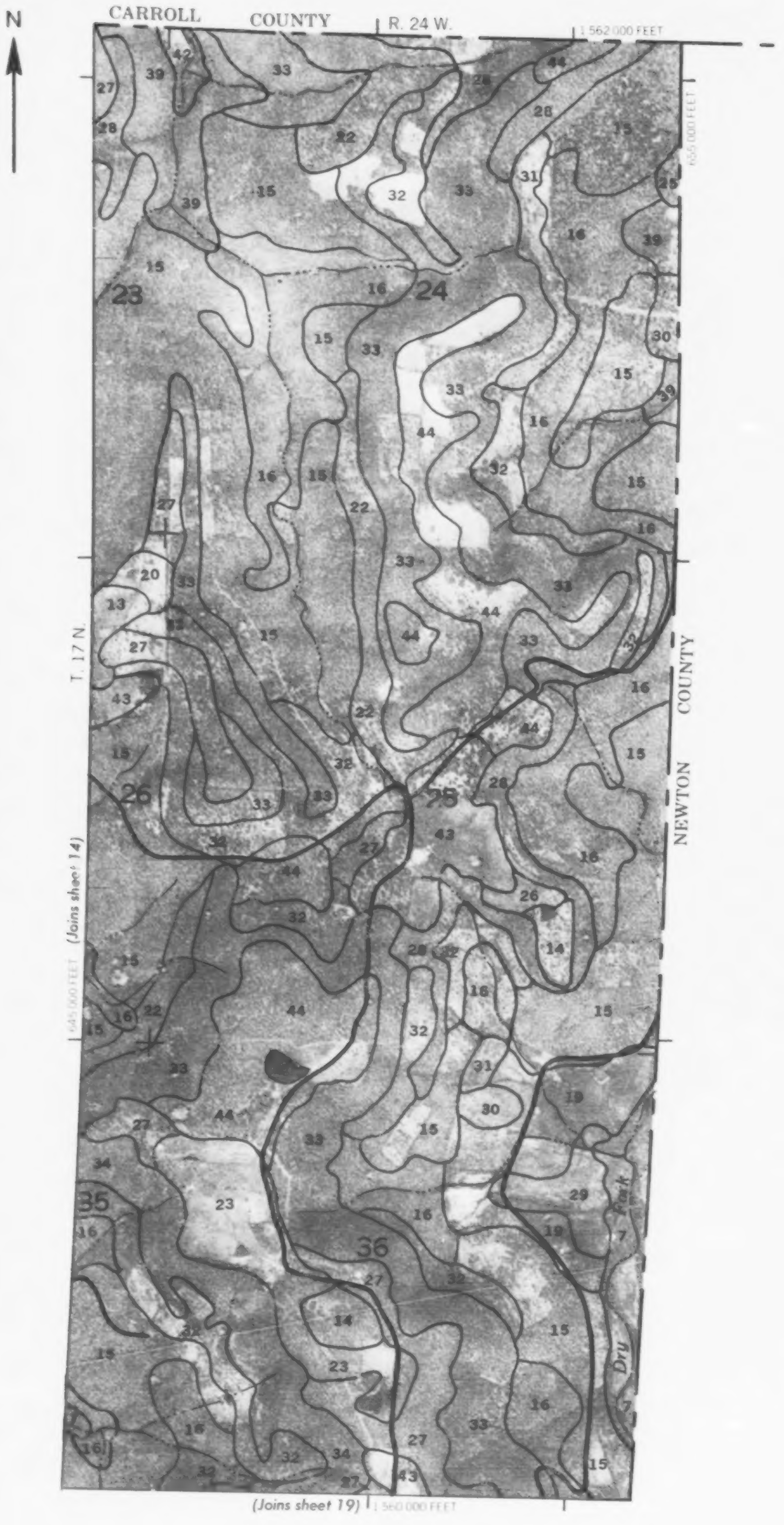

(Joins inset, sheet 20)
1 560 000 FEET
T. 16 N. | T. 17 N.
640 000 FEET
NEWTON COUNTY
R. 24 W. | R. 23 W.
Maxwell Creek
Dry Fork
Sugar Camp
Hollow
Hemstring Hollow
Cove
Hollow
Cockran Hollow
Dry
NEWTON COUNTY
(Joins sheet 18)
(Joins upper right)
1 570 000 FEET
625 000 FEET
(Joins lower left)
1 560 000 FEET
Logan Mountain
Cook Hollow
Sweden Creek
(Joins sheet 23)
(Joins sheet 28)
1
3/4
1/2
1/4
0
1 MILE

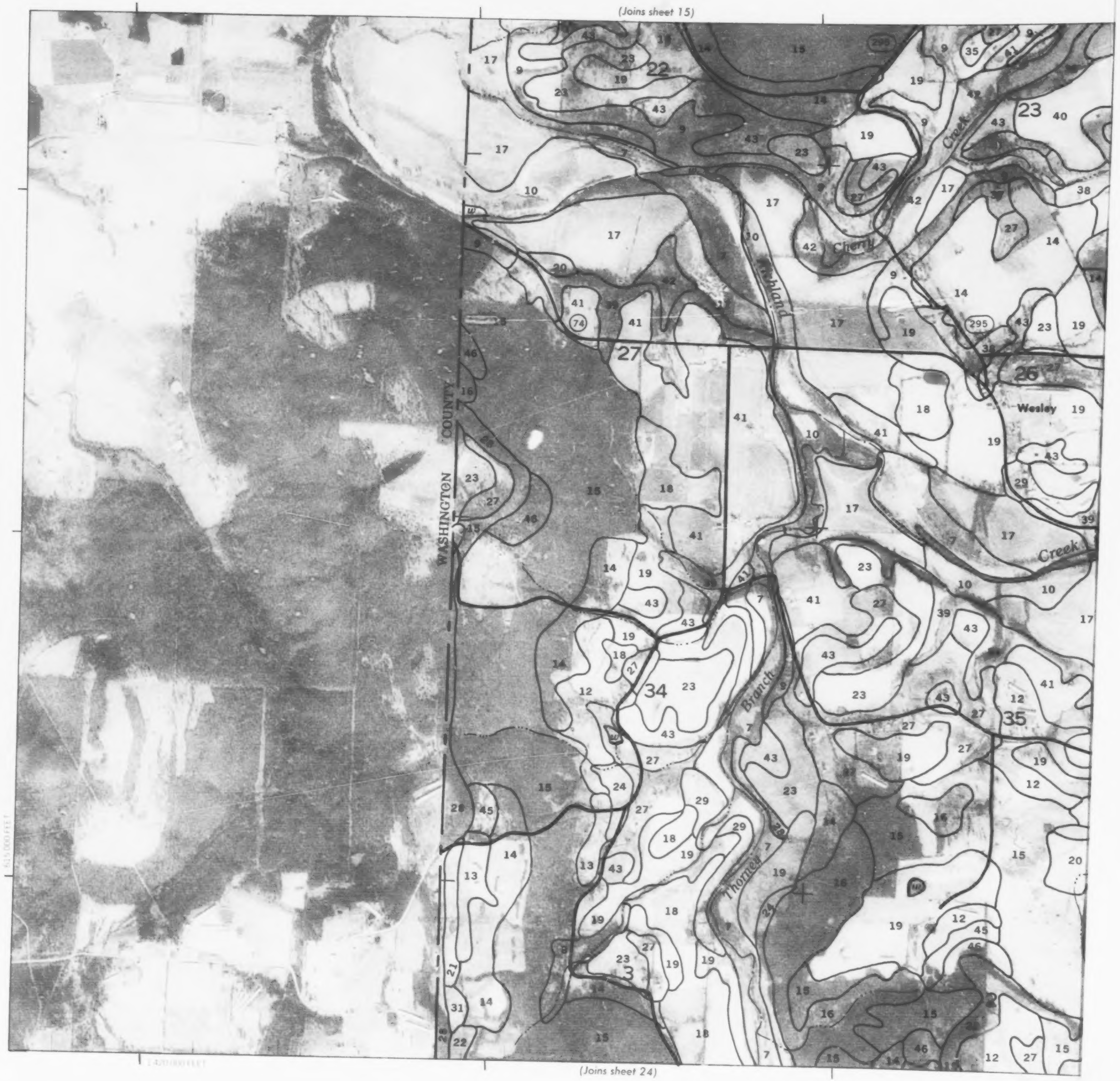
MADISON COUNTY, ARKANSAS — SHEET NUMBER 19

⑲

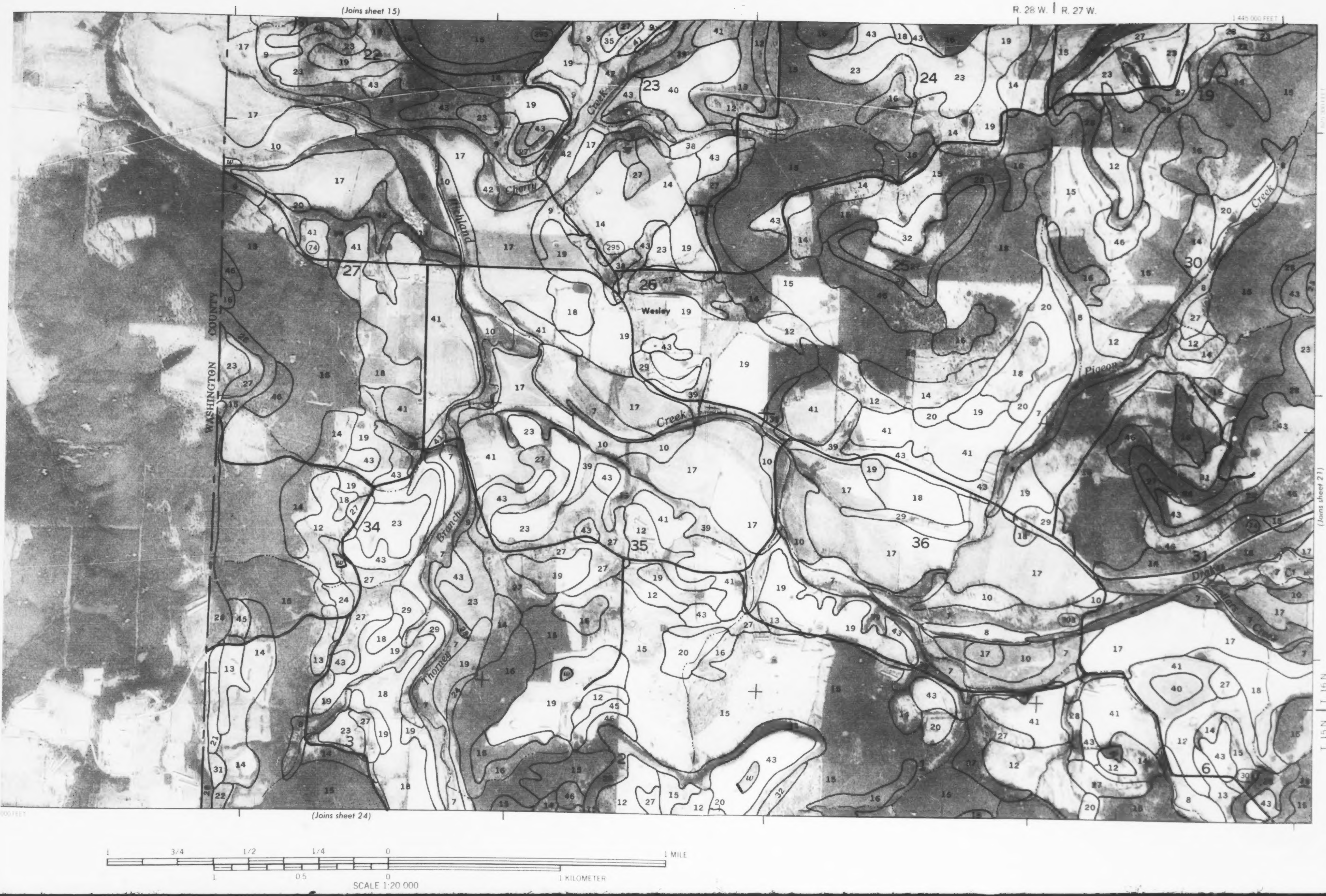


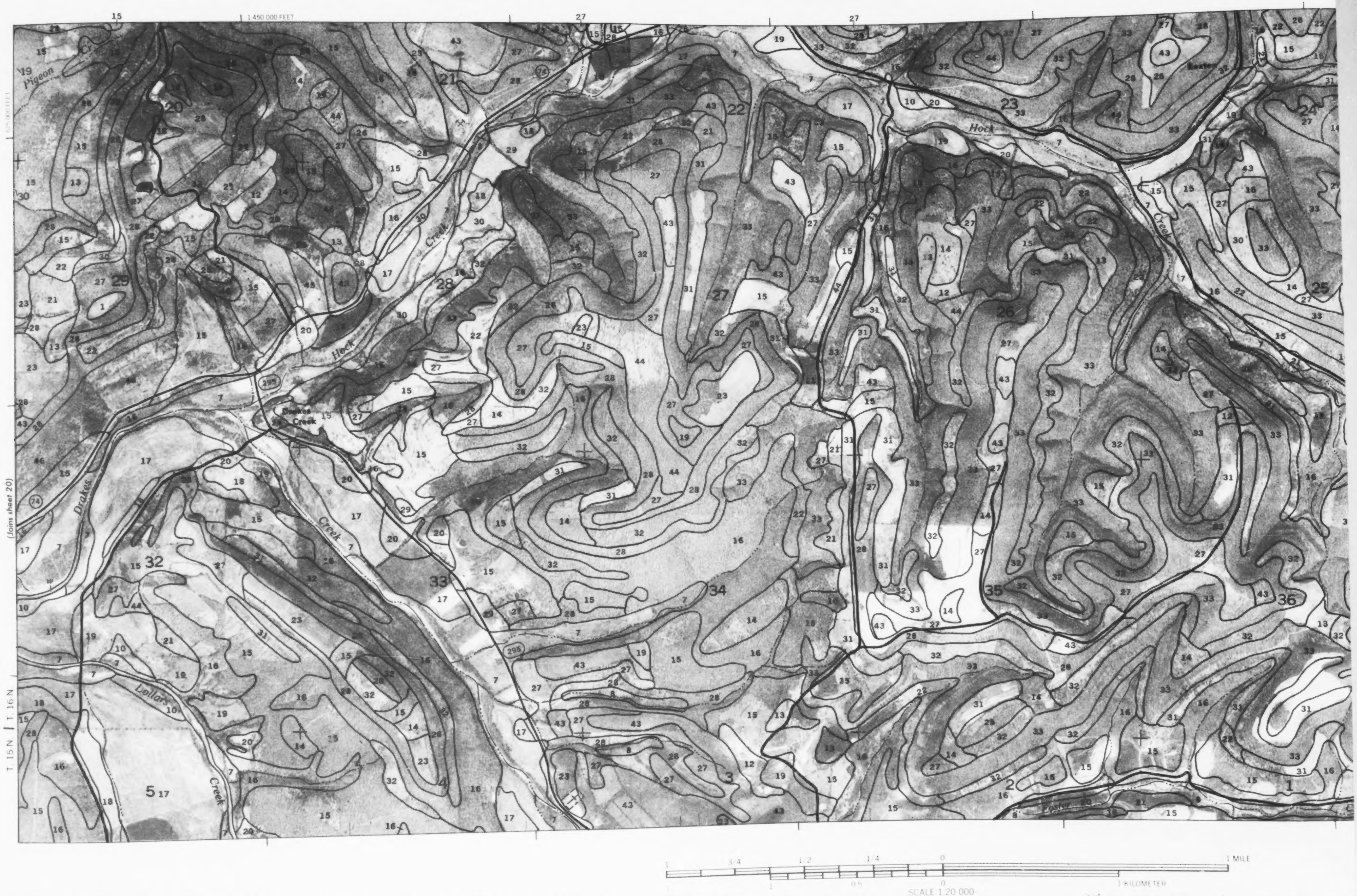
INSET B
(Joins lower left)
1 560 000 FEET
R. 24 W.
R. 23 W.
Logan Mountain
Dry Creek
Cook Hollow
Arm Mountain
Sweden Creek
Smelly Hollow
Hollow
(Joins sheet 23)
(Joins sheet 28)
NEWTON COUNTY
T. 16 N.
1 570 000 FEET
INSET A
(Joins inset, sheet 10)
R. 25 W.
Sugarcamp Hollow
Dry Fork
T. 18 N
(Joins sheet 4)
CARROLL COUNTY
(Joins inset, sheet 15)
Hollow
NEWTON COUNTY
1 MILE
1 KILOMETER
SCALE 1:20 000
N


N
CARROLL COUNTY
R. 24 W.
1 562 000 FEET
T. 17 N.
(Joins sheet 14)
NEWTON COUNTY
Dry
(Joins sheet 19)
1 560 000 FEET
2000 AND 5000-FOOT GRID TICKS

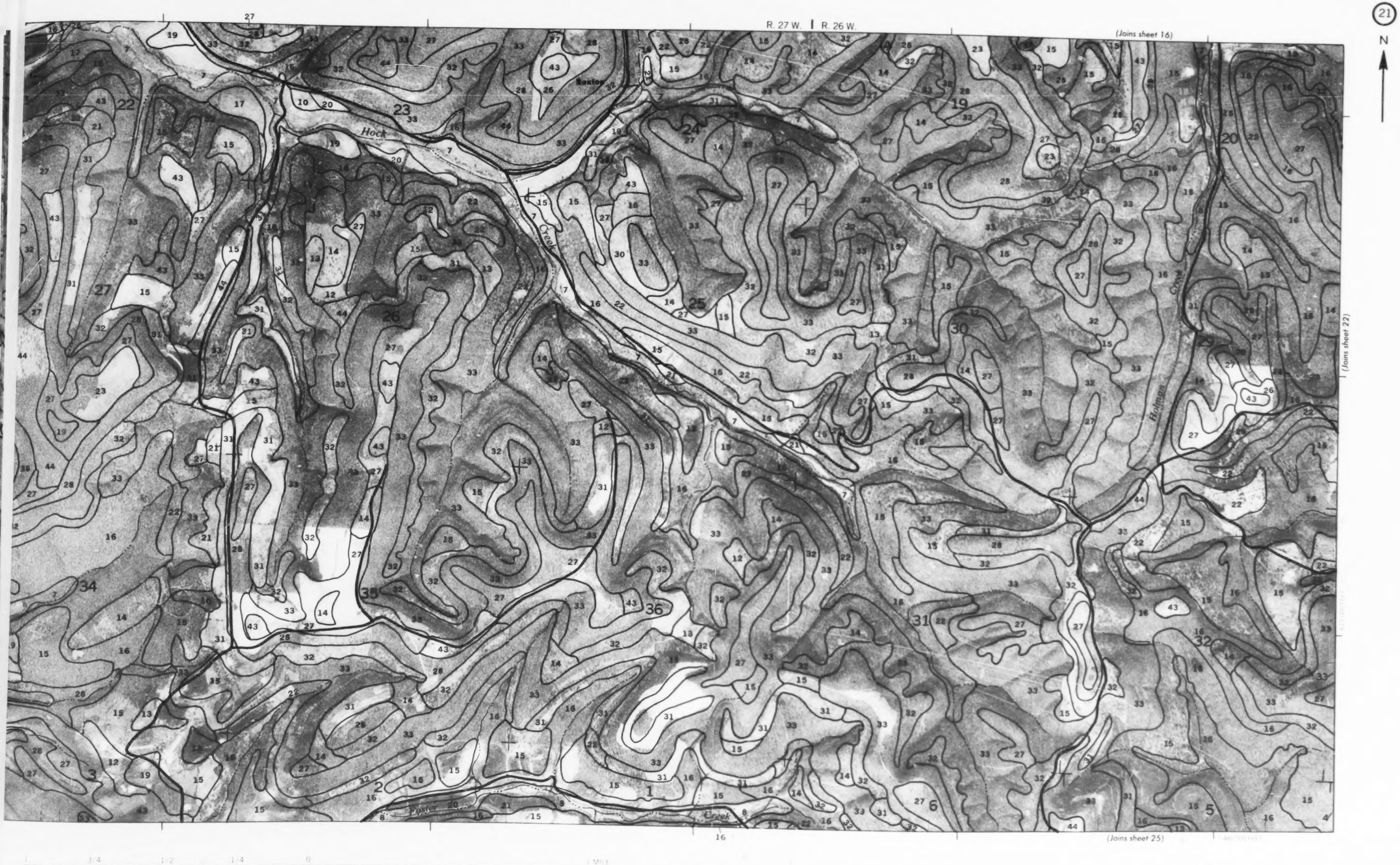

(Joins sheet 15)
WASHINGTON COUNTY
Richland
Creek
Wesley
Branch
Thornea
(Joins sheet 24)
1 3/4 1/2 1/4 0

MADISON COUNTY, ARKANSAS — SHEET NUMBER 20

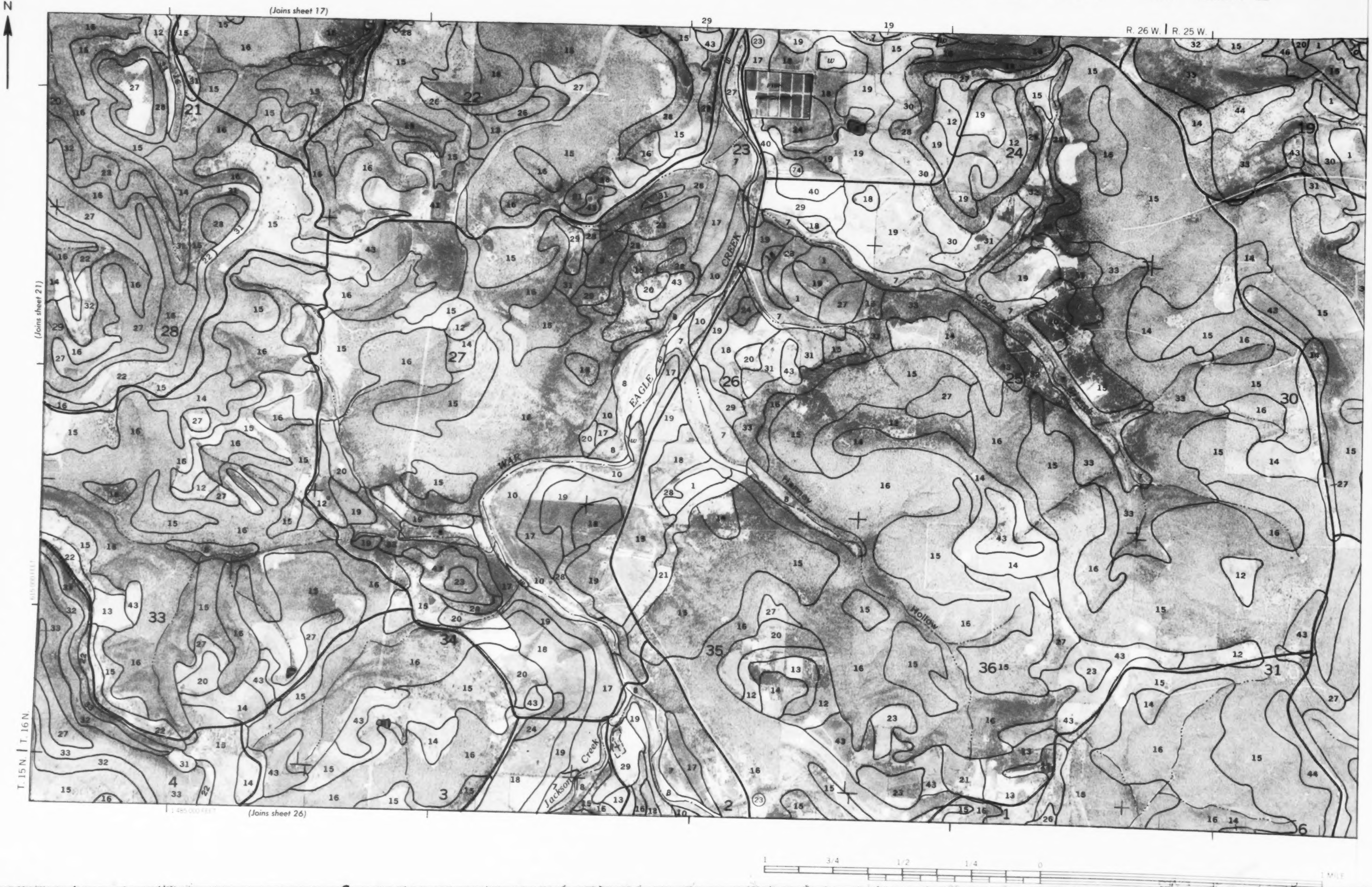

(Joins sheet 15)
R. 28 W. | R. 27 W.
1 445 000 FEET
(Joins sheet 21)
(Joins sheet 24)
T. 16 N. | T. 15 N.
WASHINGTON COUNTY
Cherry Creek
Highland
Wesley
Creek
Pigeon
Creek
Thomas Branch
Drakes Creek
295
74
303
22
23
24
19
25
26
27
30
31
34
35
36
3
2
1
6
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


1 450 000 FEET
(Joins sheet 20)
Pigeon
Hock
Creek
Drakes
Drakes Creek
Dollars
Creek
Boston
T. 16 N.
T. 15 N.
74
295
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
1
2
3
4
5
1
3/4
1/2
1/4
0
1 MILE
0.5
1 KILOMETER
SCALE 1:20 000

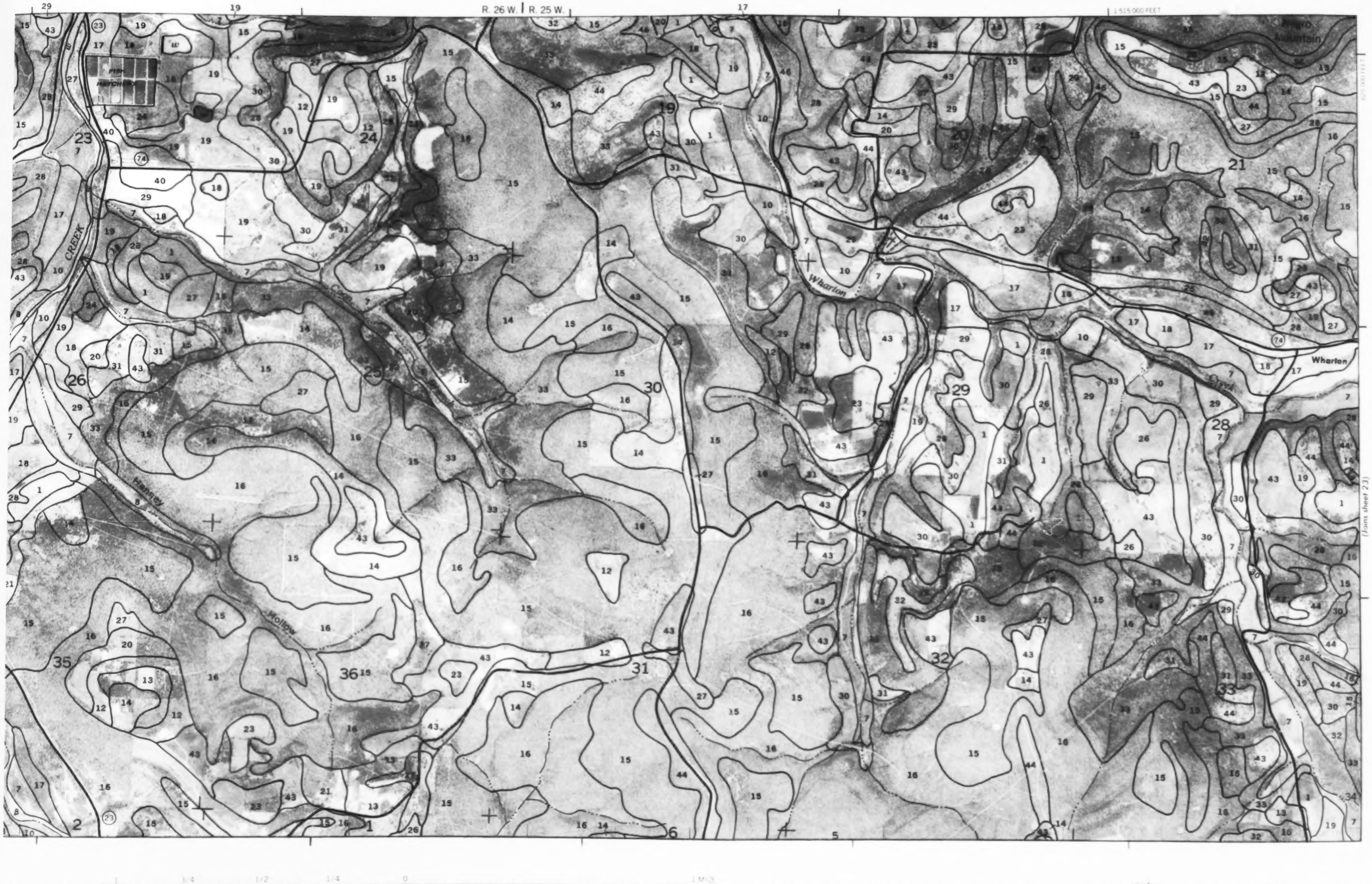
MADISON COUNTY, ARKANSAS — SHEET NUMBER 21

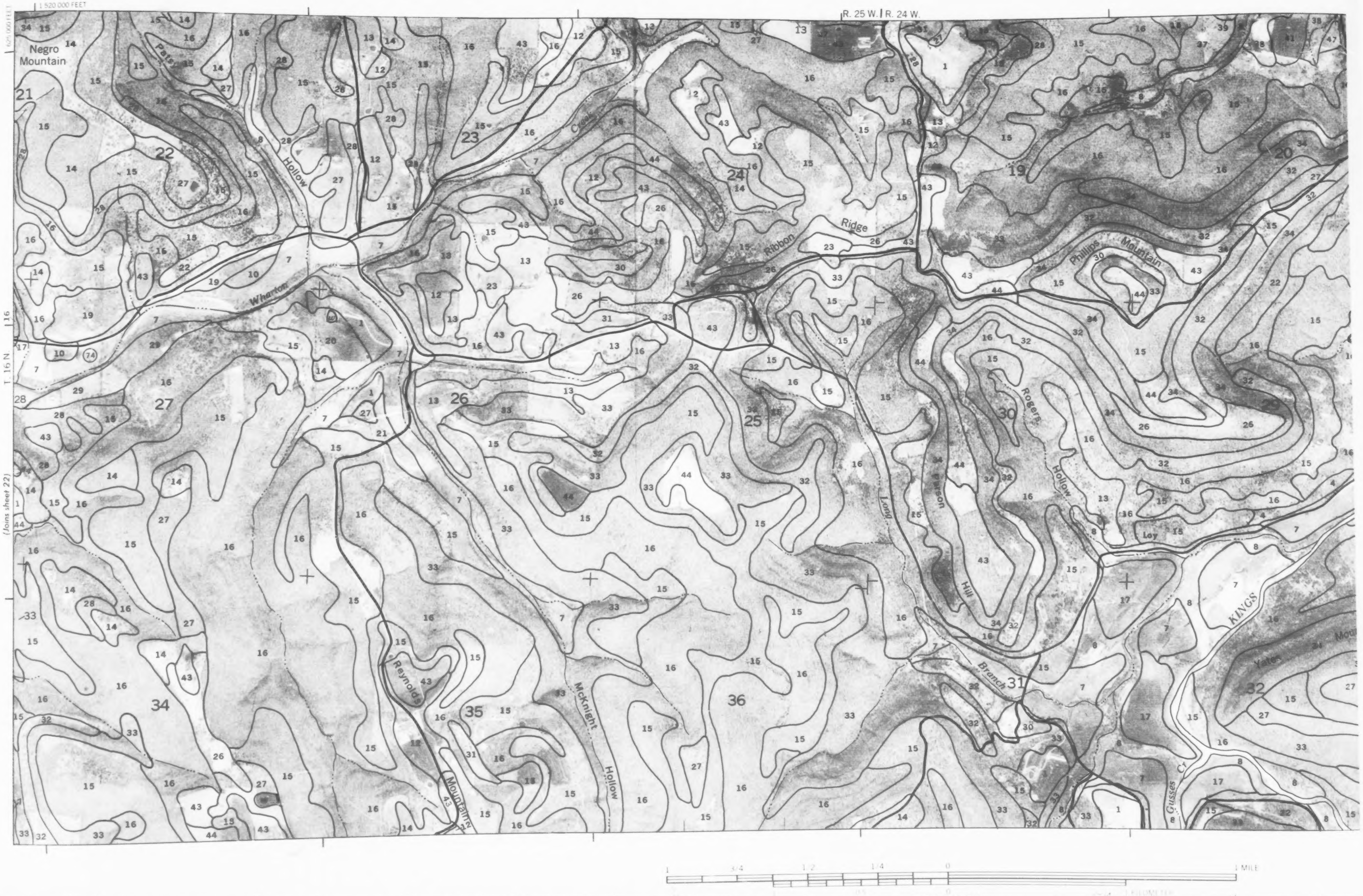


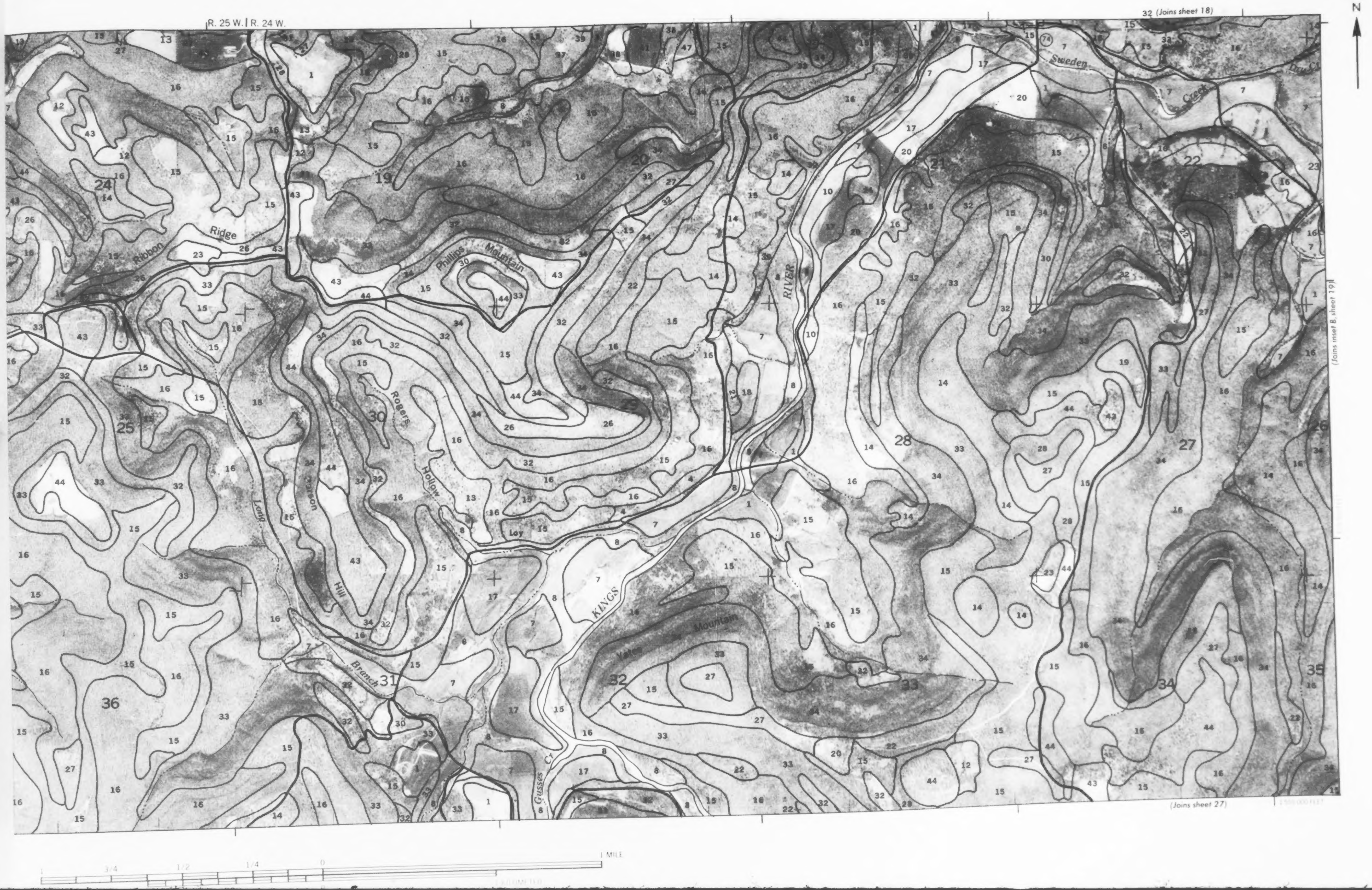
21
N
27
R. 27 W.
R. 26 W.
(Joins sheet 16)
(Joins sheet 22)
(Joins sheet 25)
16
Hock
Creek
Baxter
Holman
Creek
Foster
Creek
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
3
2
1
6
5
4
1
3/4
1/2
1/4
0
1 Mile

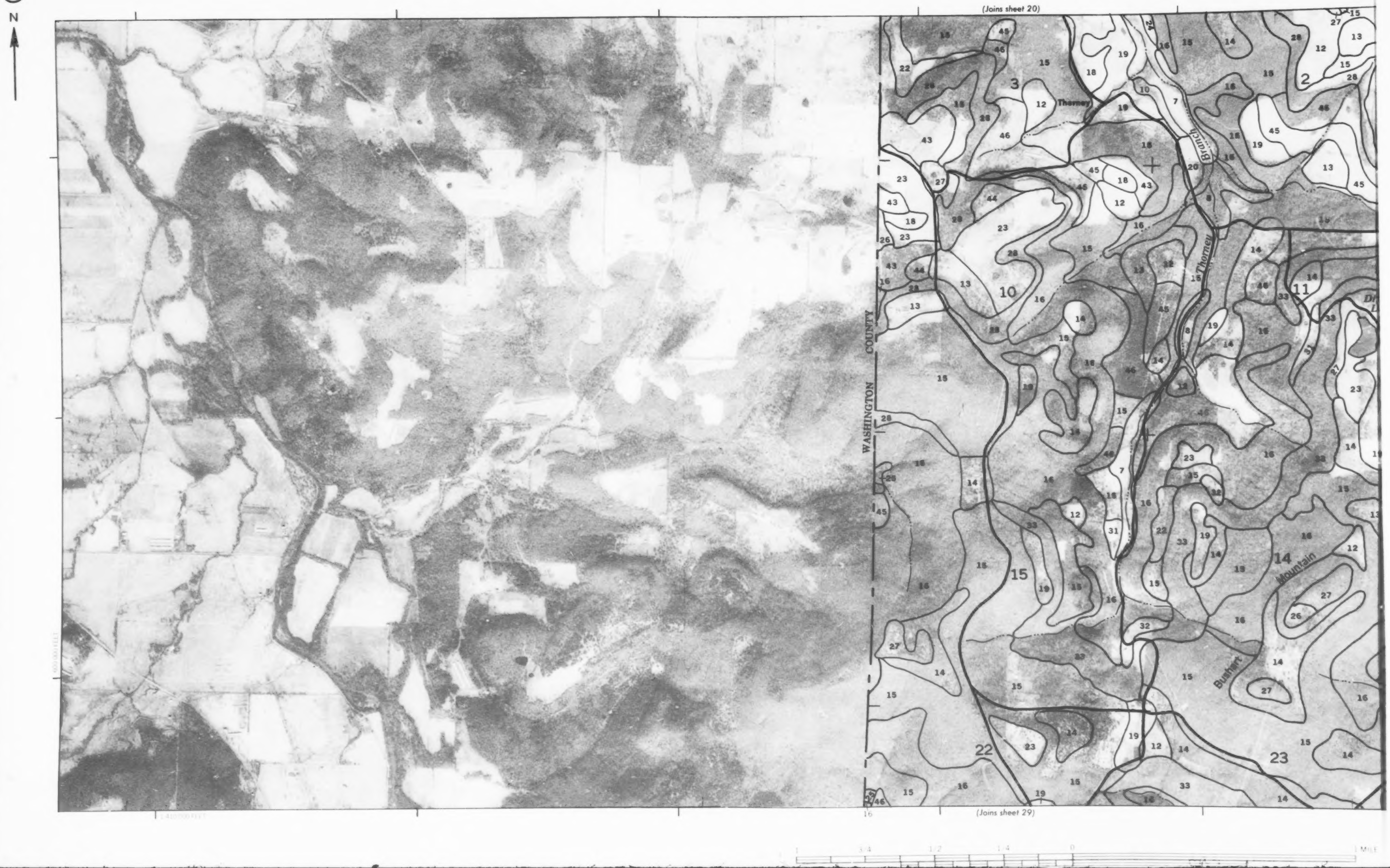

N
(Joins sheet 17)
(Joins sheet 21)
(Joins sheet 26)
R. 26 W. | R. 25 W.
T. 16 N. | T. 15 N.
WAR EAGLE CREEK
Coon
Harmon
Hollow
Jackson Creek
23
74
21
22
23
24
19
28
27
26
25
30
33
34
35
36
31
4
3
2
1
6
1
3/4
1/2
1/4
0
1 MILE

MADISON COUNTY, ARKANSAS — SHEET NUMBER 22

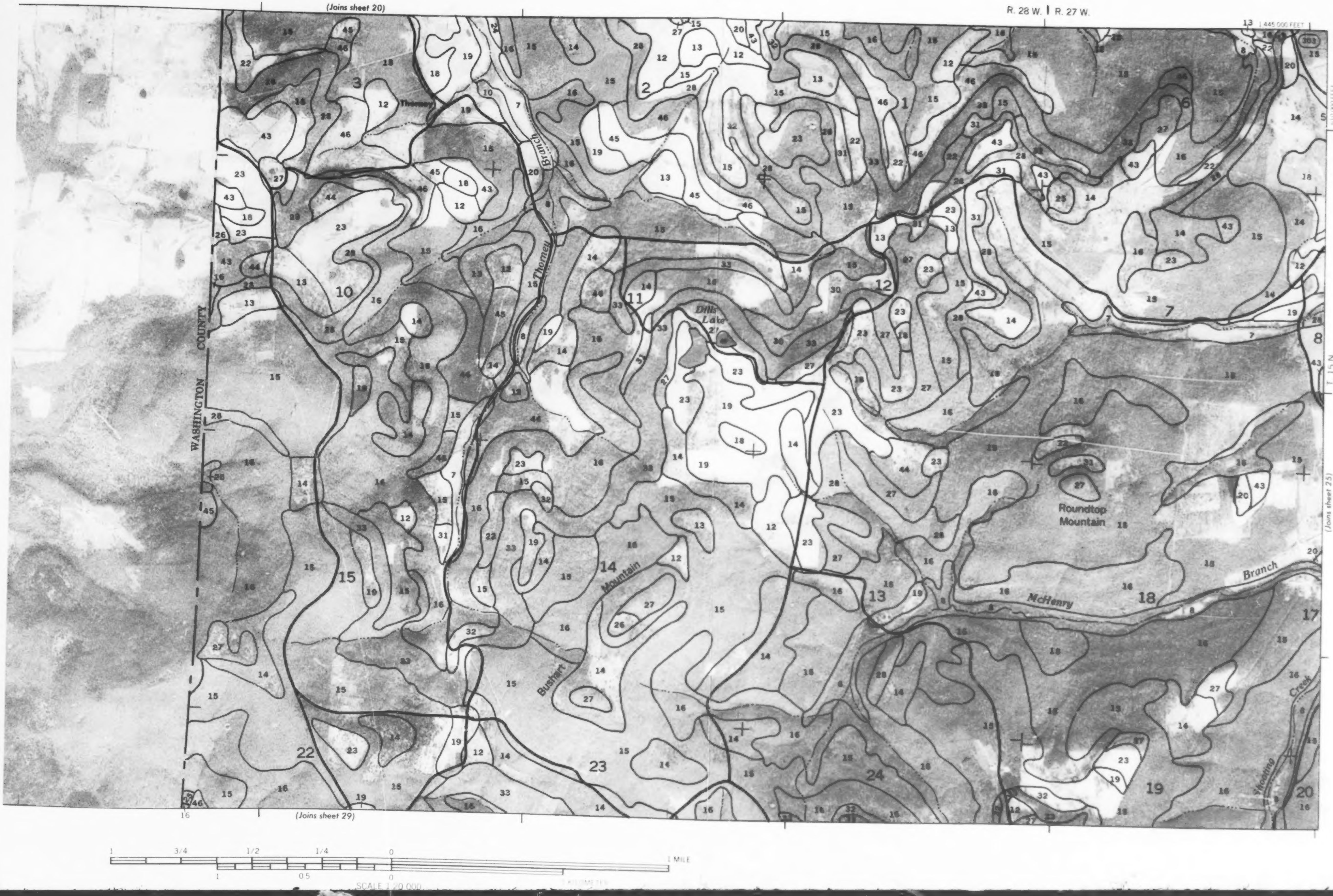

R. 26 W. | R. 25 W.
1 515 000 FEET
FISH HATCHERY
CREEK
Coon
Hanney
Hollow
Wharton
Wharton Creek
Mountain
74
23
(Joins sheet 23)
1
1/2
1/4
0
1 Mile

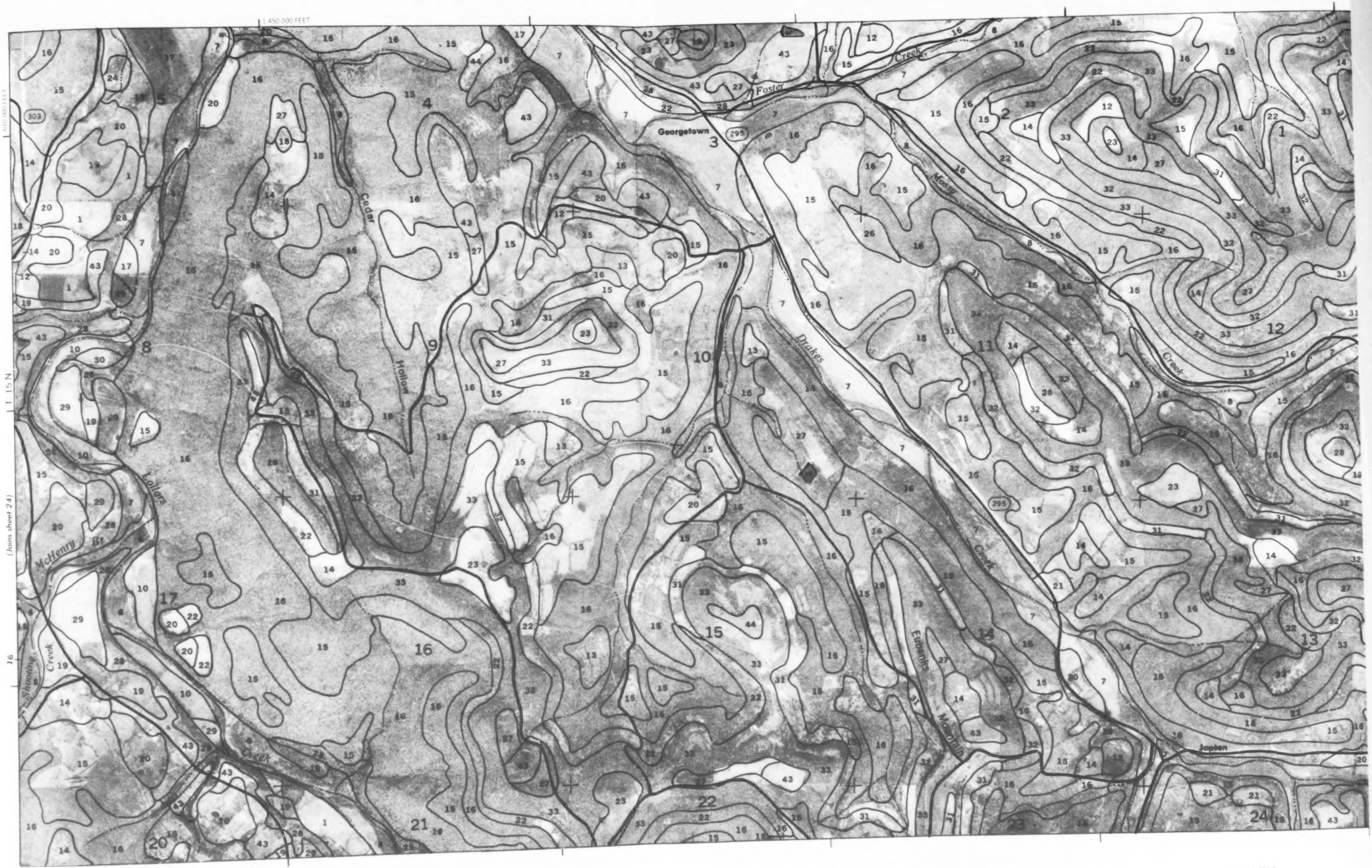

1 520 000 FEET
625 000 FEET
R. 25 W. | R. 24 W.
T. 16 N.
(Joins sheet 22)
Negro Mountain
Pate
Hollow
Wharton
Creek
Ribbon
Ridge
Phillips
Mountain
Rogers
Hollow
Long
Pearson
Hill
Branch
Loy
KINGS
Yates
Mountain
Gusses Cr
Reynolds
Mountain
McKnight
Hollow
74
16
21
22
23
24
19
20
26
27
25
30
29
28
34
35
36
31
32
33
1
3/4
1/2
1/4
0
1 MILE
SCALE 1:20 000


R. 25 W.
R. 24 W.
32 (Joins sheet 18)
N
(Joins inset 8, sheet 19)
(Joins sheet 27)
Ribbon Ridge
Phillips Mountain
Rogers Hollow
Carson Hill
Long Branch
Loy
KINGS RIVER
Gusses Cr
Yates Mountain
Sweden Creek
Dry Cr
74
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
1
3/4
1/2
1/4
0
1 MILE
KILOMETER


N
(Joins sheet 20)
(Joins sheet 29)
WASHINGTON COUNTY
Thorney
Thorney
Branch
Mountain
Bushart
1
3/4
1/2
1/4
0
1 MILE

MADISON COUNTY, ARKANSAS — SHEET NUMBER 24


(Joins sheet 20)
R. 28 W.
R. 27 W.
1 445 000 FEET
303
Thorney
Thorney Branch
Dills Lake
WASHINGTON COUNTY
T. 15 N.
(Joins sheet 25)
Roundtop Mountain
McHenry Branch
Bushart Mountain
Shooting Creek
(Joins sheet 29)
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000

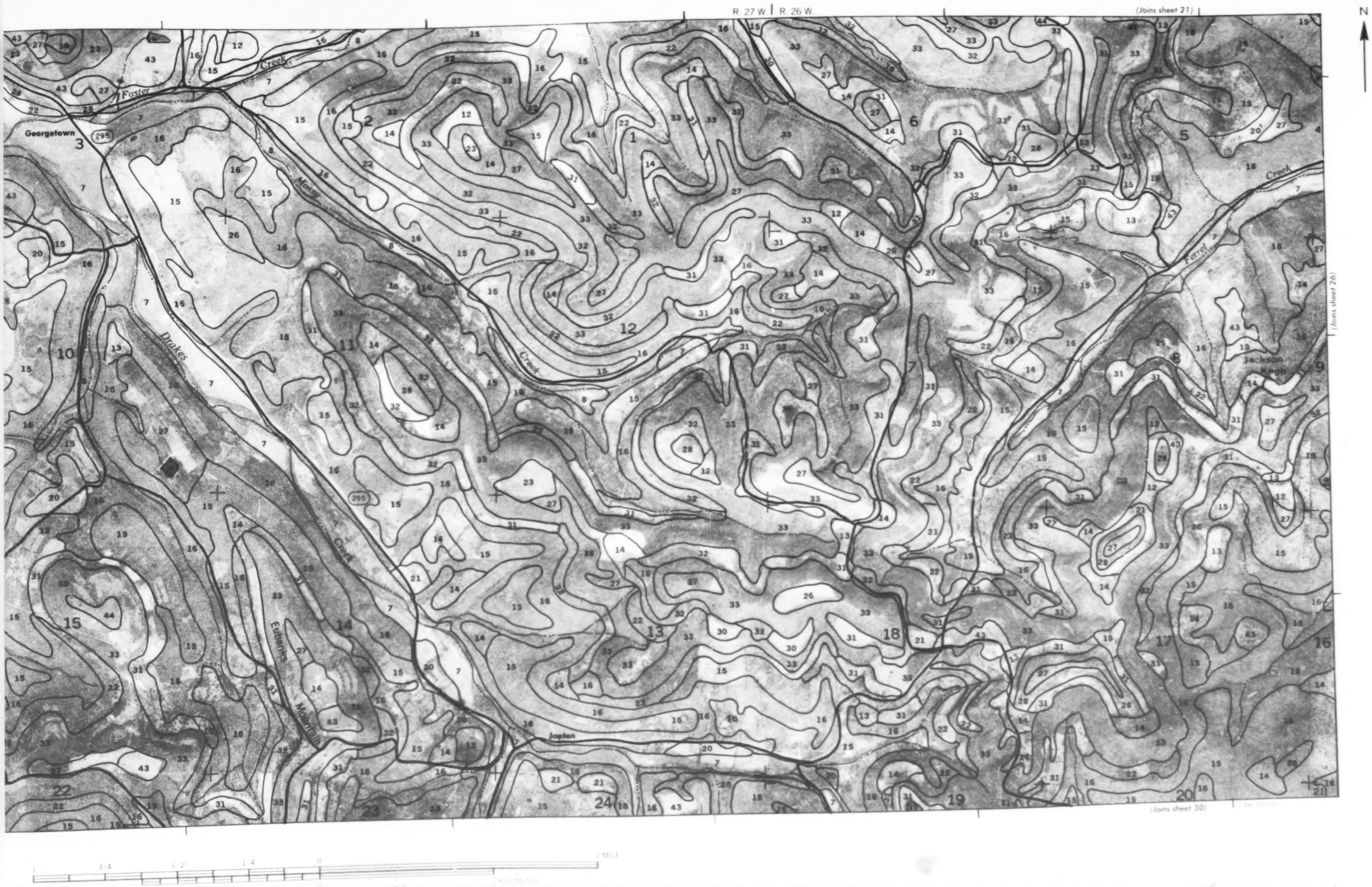

1 450 000 FEET
T 15 N
(Joins sheet 24)
Georgetown
Foster Creek
Mossy Creek
Cedar Hollow
Drakes Creek
Lollars Creek
McHenry Br
Shooting Creek
Eubanks Mountain
Japton
303
295
1
2
3
4
5
8
9
10
11
12
13
14
15
16
17
20
21
22
23
24

1 3/4 1/2 1/4 0 1 MILE

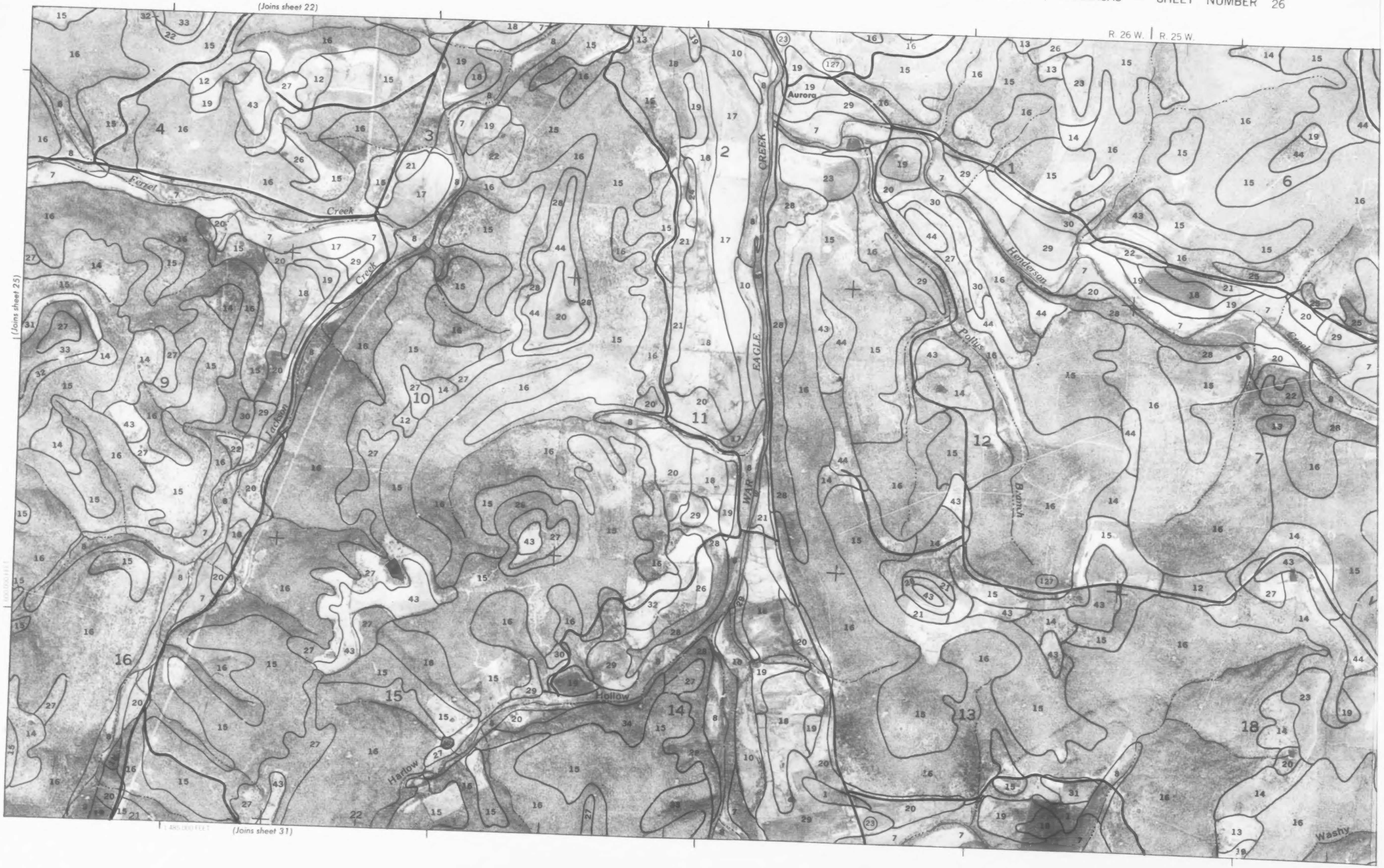
1 .5 0 1 KILOMETER

SCALE 1:20 000

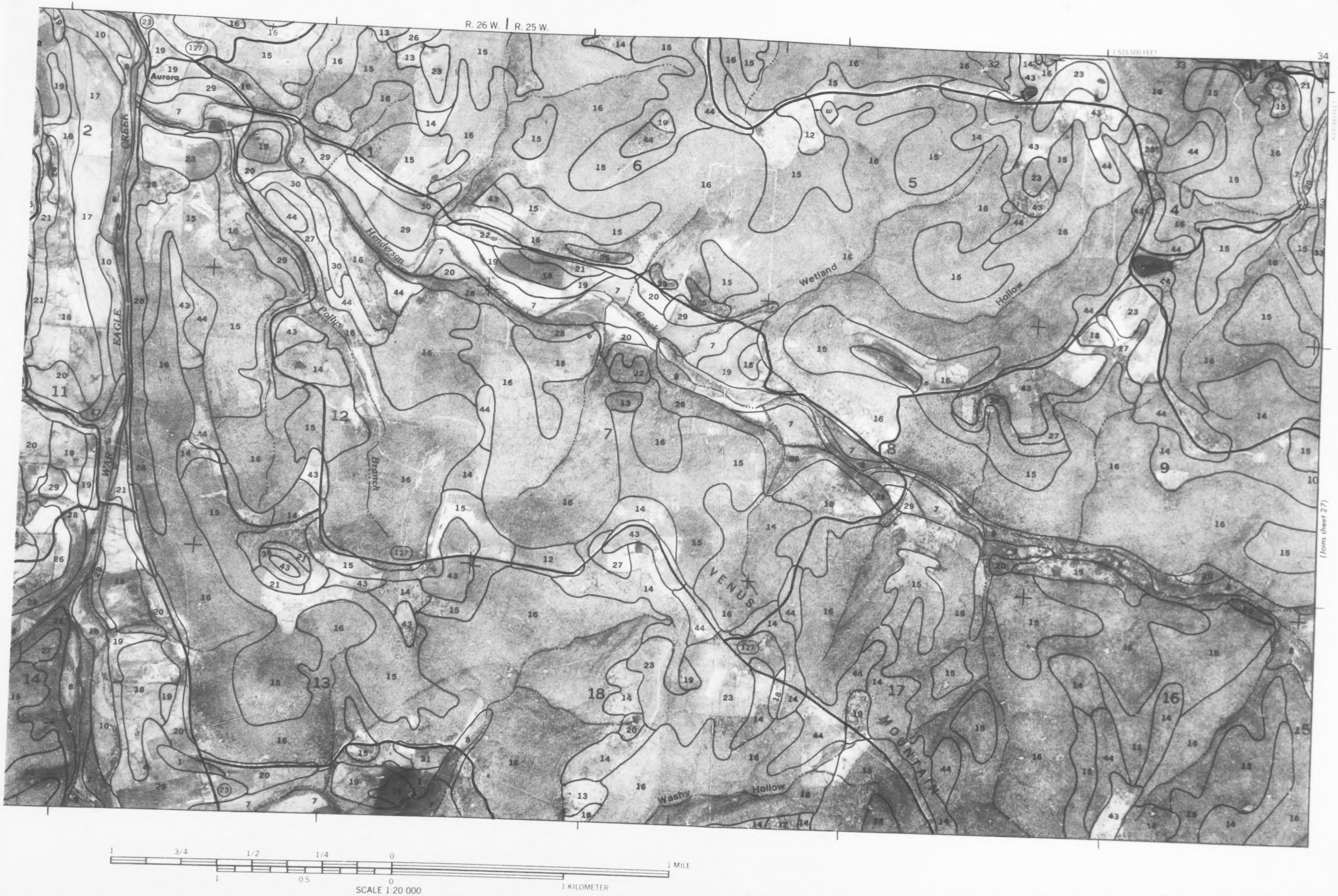
MADISON COUNTY, ARKANSAS — SHEET NUMBER 25


R. 27 W.
R. 26 W.
(Joins sheet 21)
(Joins sheet 26)
(Joins sheet 30)
N
Georgetown
295
Foster Creek
Mossy Creek
Drakes Creek
Eubanks Mountain
Ferrel Creek
Jackson Knob
Japton
1
3/4
1/2
1/4
0
1 MILE

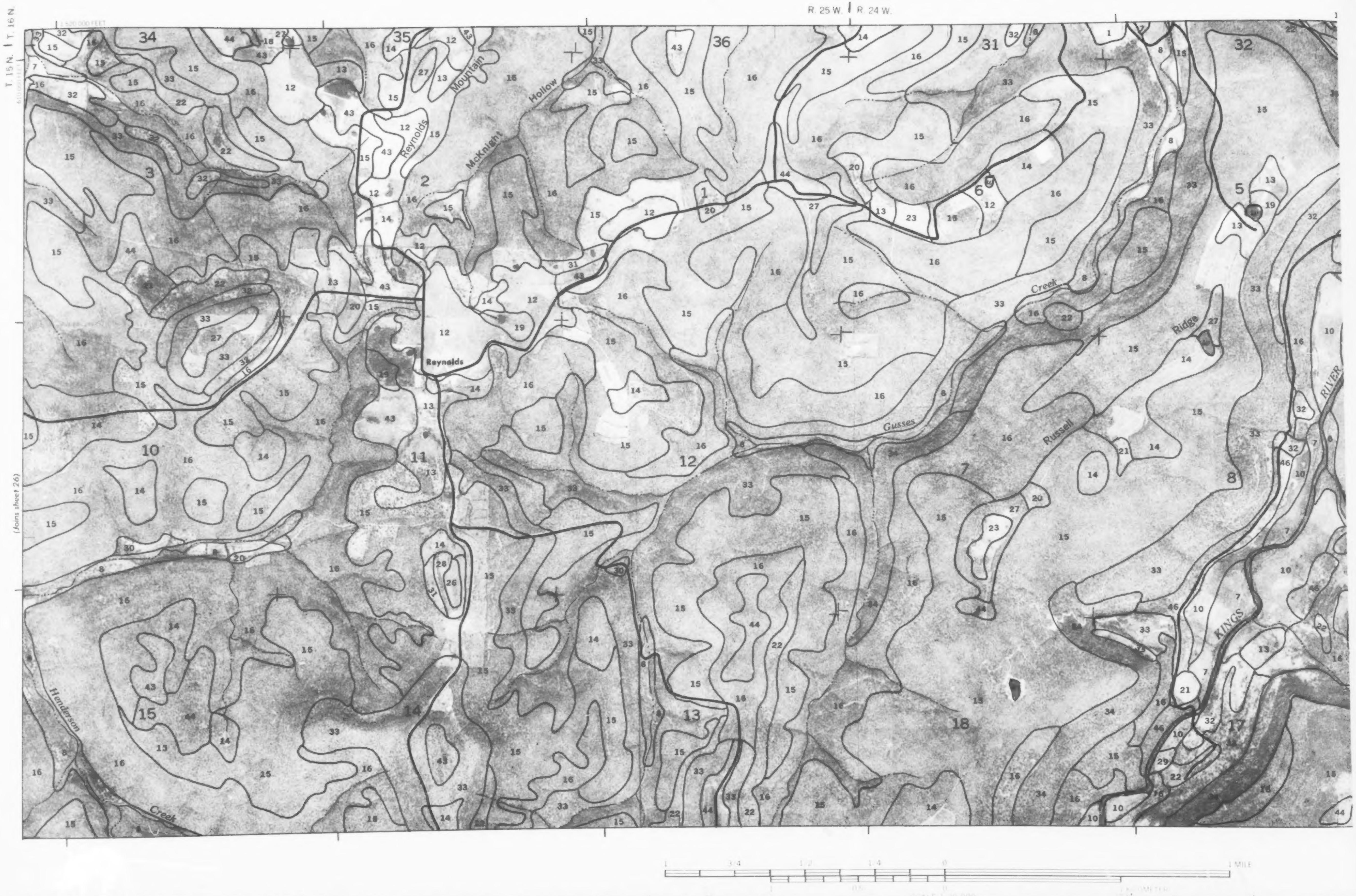
N


(Joins sheet 22)
(Joins sheet 25)
(Joins sheet 31)
R. 26 W.
R. 25 W.
Aurora
Ferret Creek
Jackson Creek
WAR EAGLE CREEK
Henderson Creek
Pollys Branch
Hollow
Harlow
Washy
1,485,000 FEET
23
127

MADISON COUNTY, ARKANSAS — SHEET NUMBER 26

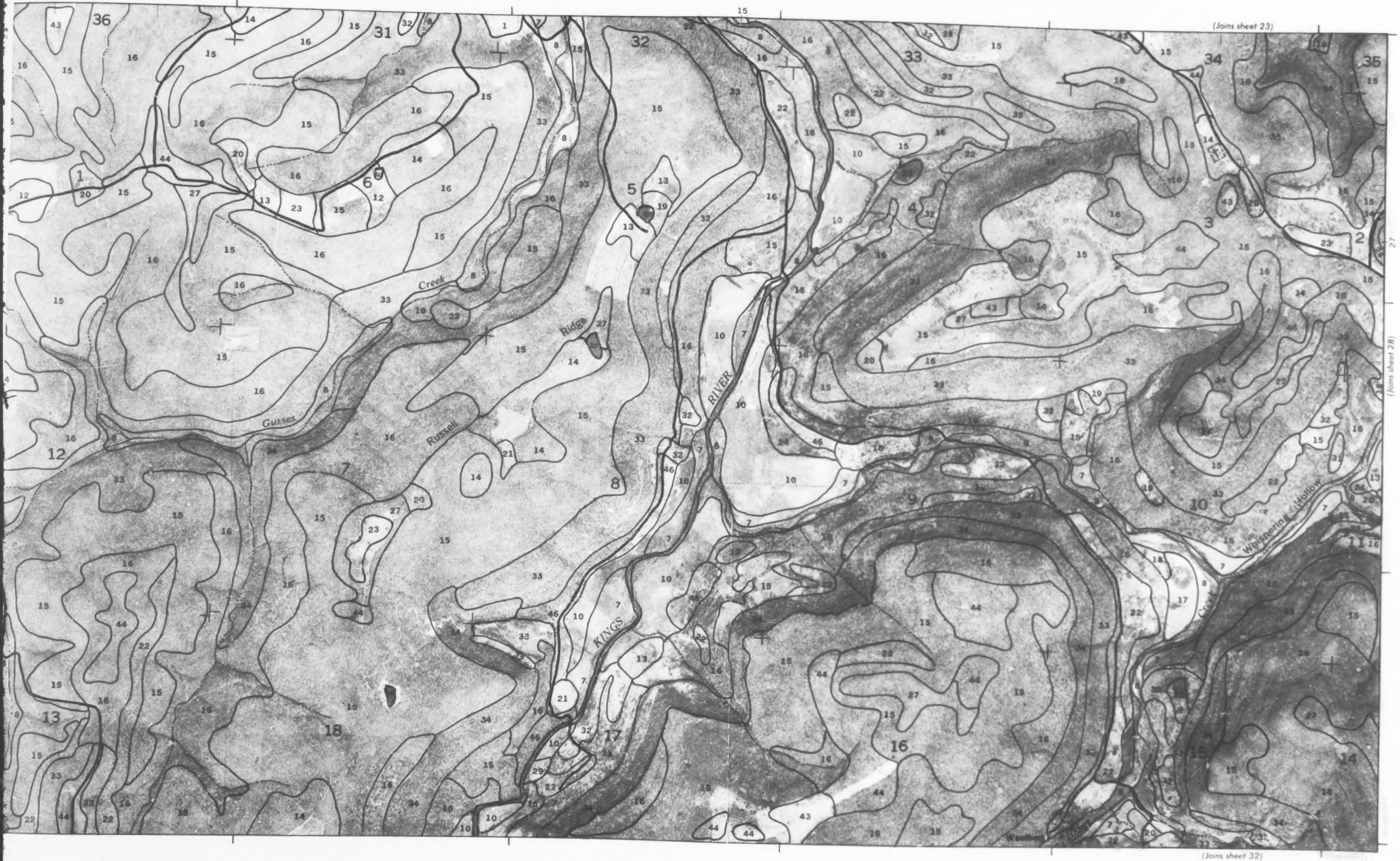

R. 26 W. | R. 25 W.
T. 15 N | T. 16 N
1 515 000 FEET
34
Aurora
WAR EAGLE CREEK
Henderson Creek
Pollys Branch
Wetland Hollow
VENUS MOUNTAIN
Washy Hollow
(Joins sheet 27)
23
127
1
2
4
5
6
7
8
9
11
12
13
14
16
17
18
1 3/4 1/2 1/4 0
1 MILE
1 0.5 0
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 27


R. 25 W.
R. 24 W.
T. 15 N.
T. 16 N.
(Joins sheet 26)
Reynolds
Reynolds
Mountain
McKnight
Hollow
Gusses
Creek
Russell
Ridge
KINGS
RIVER
Henderson
Creek
34
35
36
31
32
3
2
1
6
5
10
11
12
7
8
15
14
13
18
17
1
3/4
1/2
1/4
0
1 MILE
SCALE 1:20 000
1 KILOMETER

MADISON COUNTY, ARKANSAS — SHEET NUMBER 27

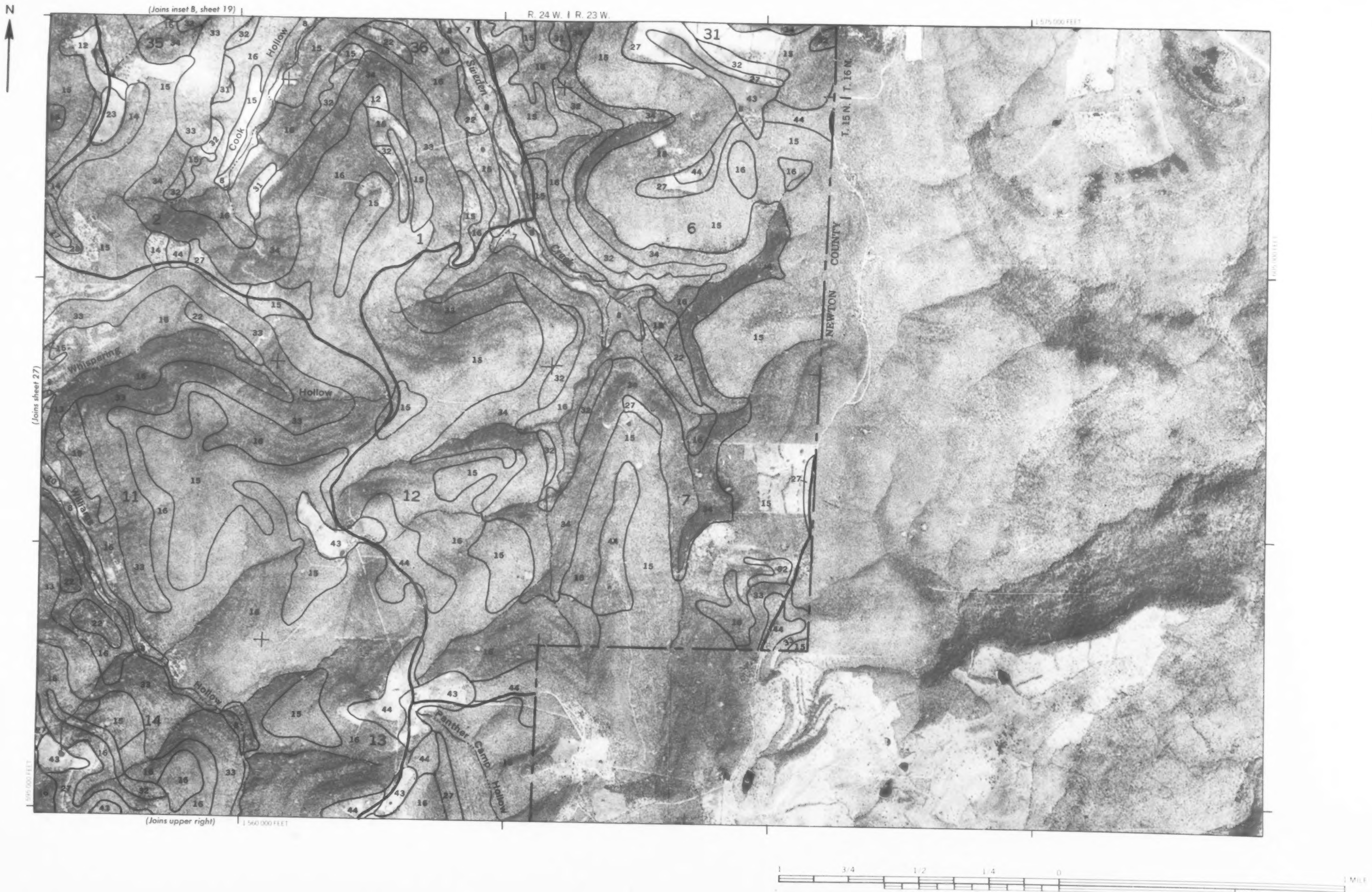
R. 25 W. | R. 24 W.

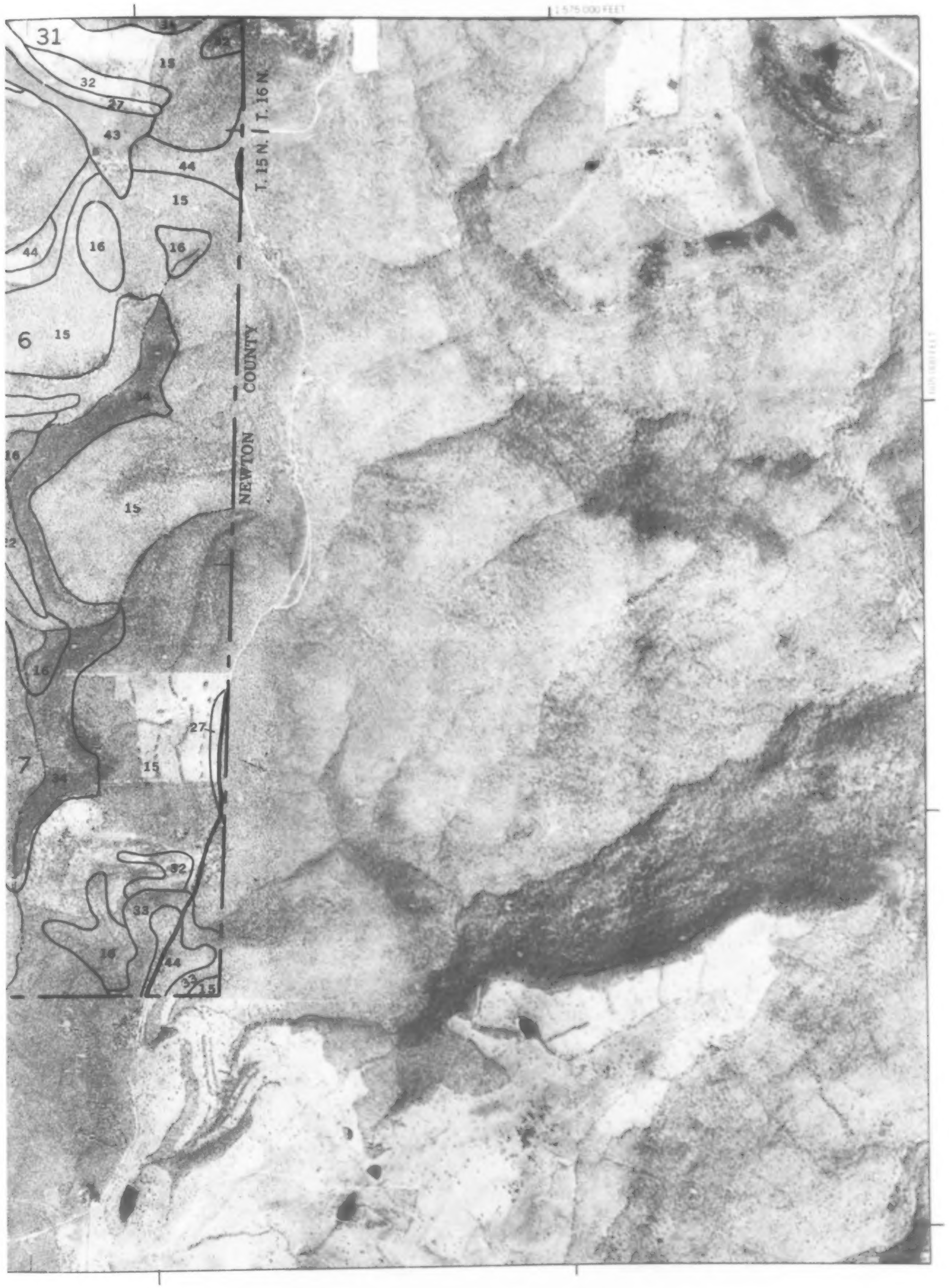

(27)
N
(Joins sheet 23)
(Joins sheet 28)
(Joins sheet 32)
Gusses
Creek
Russell
Ridge
KINGS
RIVER
Whispering Hollow
Creek
36
31
32
33
34
35
1
6
5
4
3
2
12
7
8
9
10
11
13
18
17
16
15
14

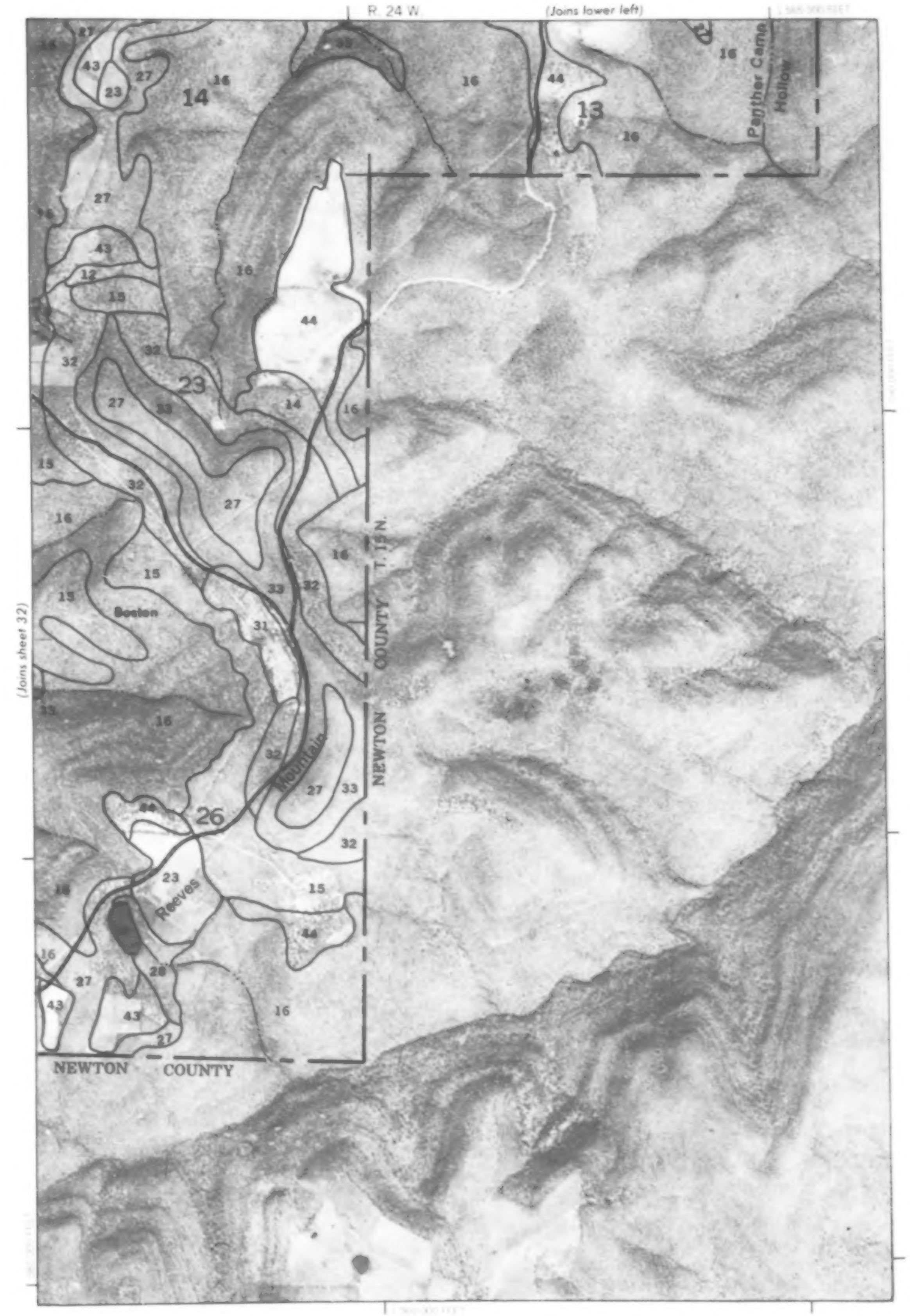
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

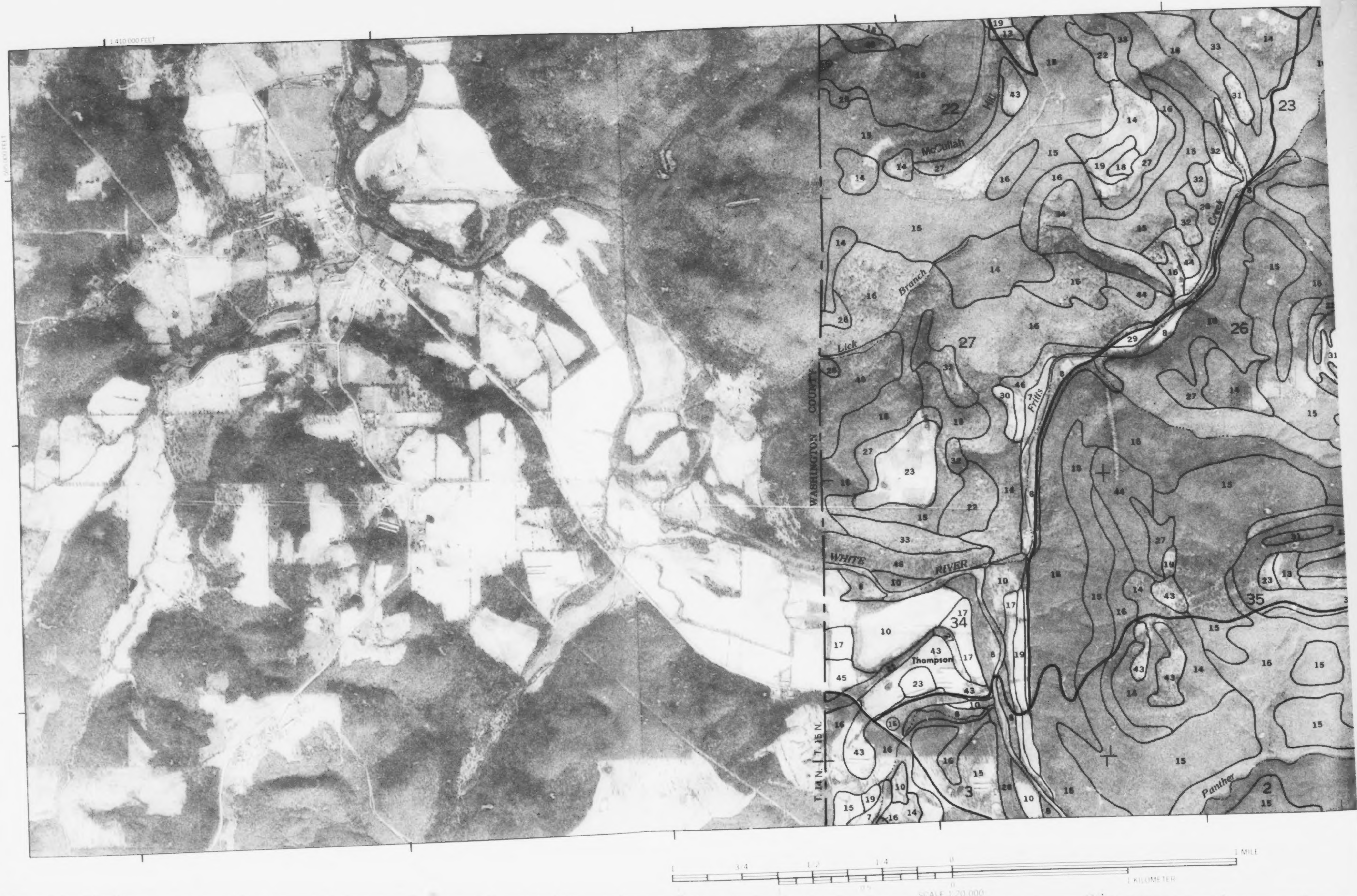
SCALE 1:20 000


N
(Joins inset B, sheet 19)
R. 24 W. | R. 23 W.
1 575 000 FEET
T. 16 N.
T. 15 N.
NEWTON COUNTY
(Joins sheet 27)
(Joins upper right)
1 560 000 FEET
Cook
Hollow
Sneddon
Creek
Whispering
Hollow
Williams
Hollow
Panther Camp Hollow
35
36
31
1
2
6
11
12
7
14
13
1
3/4
1/2
1/4
0
1 MILE

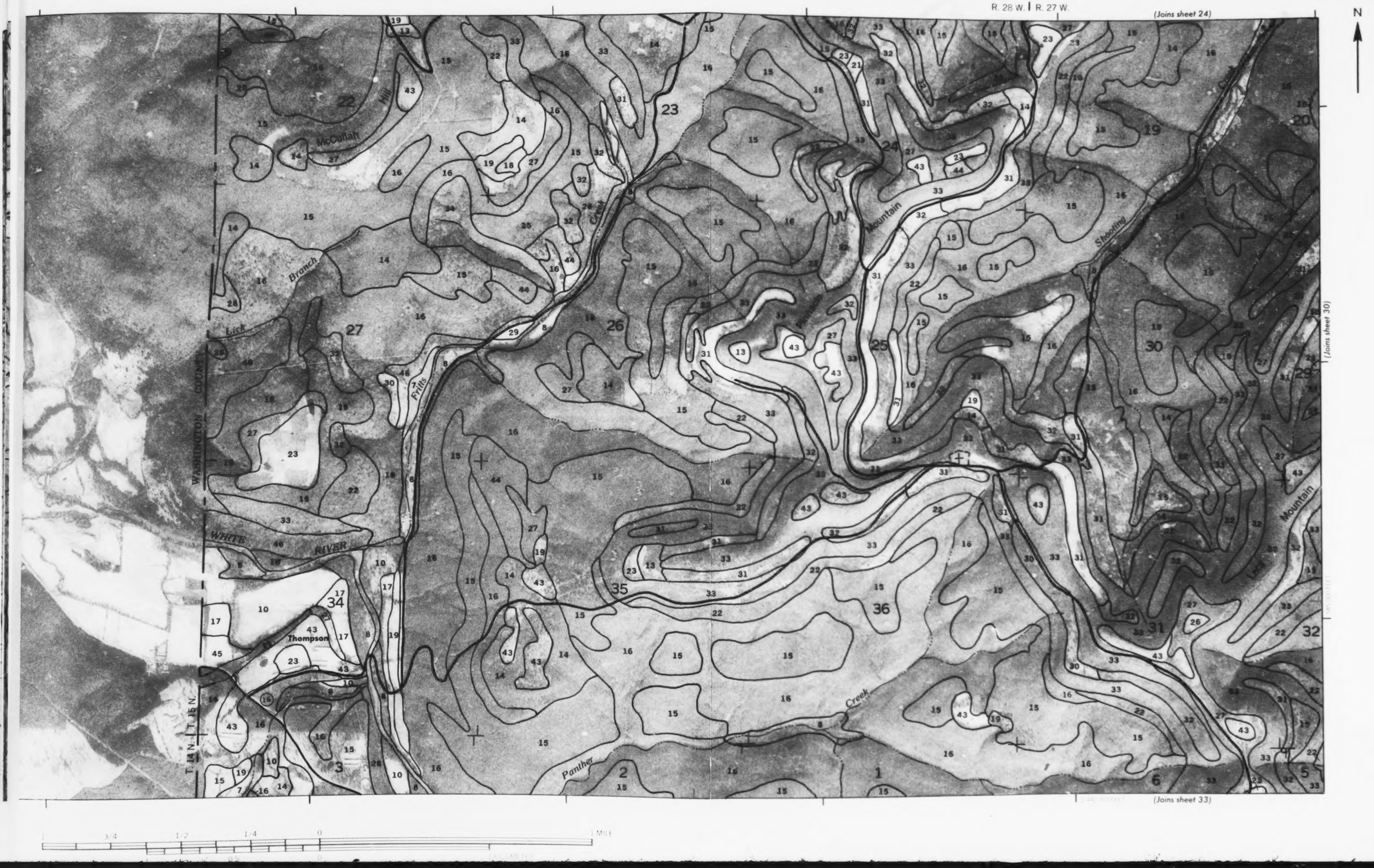

1 575 000 FEET
31
32
27
43
44
15
16
6
7
23
33
T. 15 N. | T. 16 N.
NEWTON COUNTY


R. 24 W.
(Joins lower left)
14
13
23
26
Panther Came Hollow
Boston
Mountain
Reeves
(Joins sheet 32)
NEWTON COUNTY
T. 15 N.
NEWTON COUNTY
12
15
16
27
31
32
33
43
44

1
3/4
1/2
1/4
0
1 MILE


1 410 000 FEET
WASHINGTON COUNTY
T. 14 N. | T. 15 N.
WHITE RIVER
McCullah Hill
Lick Branch
Frills Creek
Thompson
Panther
22
27
23
26
34
35
3
2
1 MILE
1 KILOMETER
SCALE 1:20 000

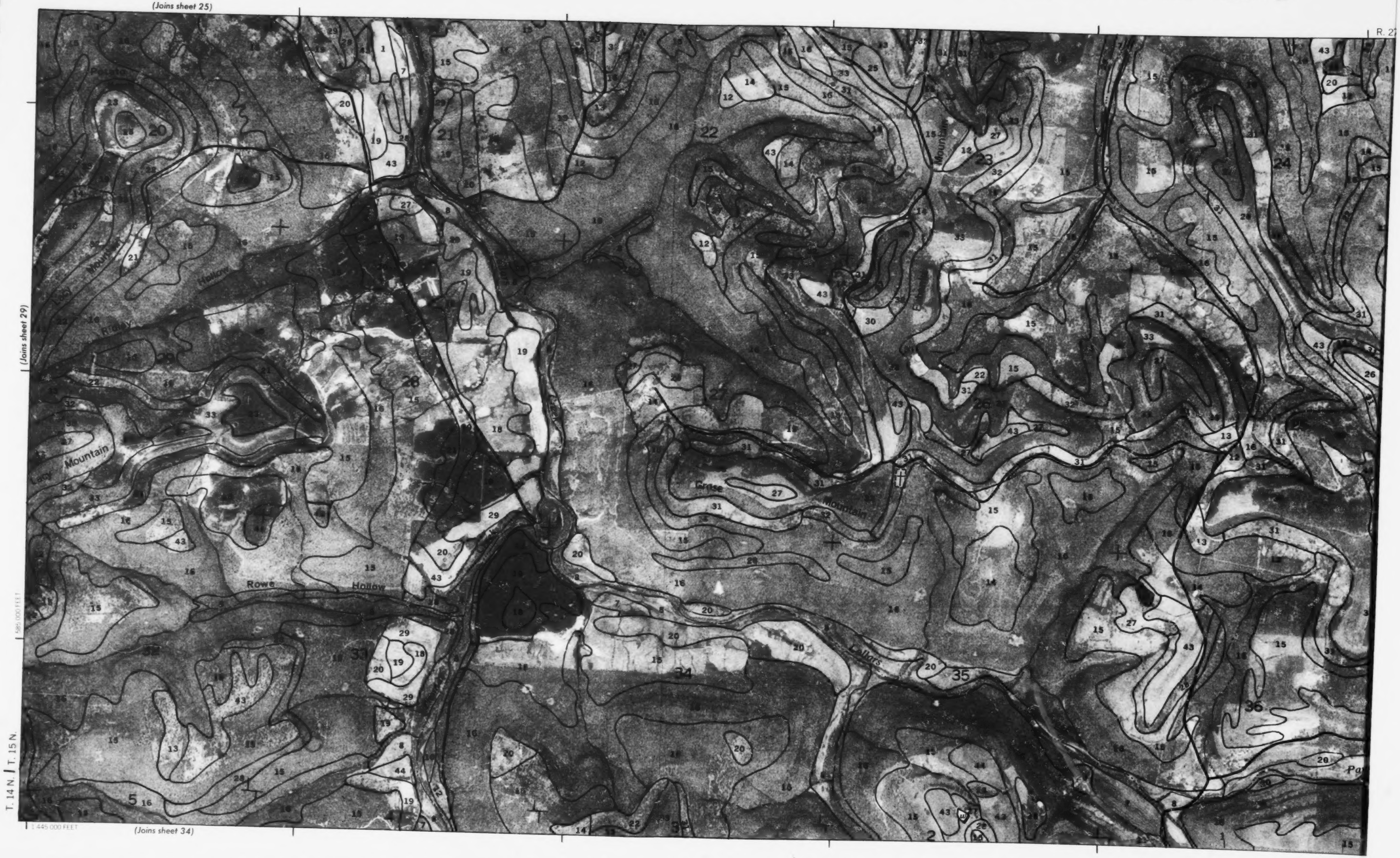
MADISON COUNTY, ARKANSAS — SHEET NUMBER 29


29
N
R. 28 W. | R. 27 W.
(Joins sheet 24)
(Joins sheet 30)
(Joins sheet 33)
T. 15 N.
T. 14 N.
WASHINGTON COUNTY
McCullah Hill
Lick Branch
WHITE RIVER
Fritts
Thompson
Mountain
Shooting Creek
Mountain
Panther Creek
22
23
24
19
20
27
26
25
30
29
34
35
36
31
32
3
2
1
6
5
1 MILE
3/4
1/2
1/4
0
KILOMETER
0.5
0

MADISON COUNTY, ARKANSAS — SHEET NUMBER 30

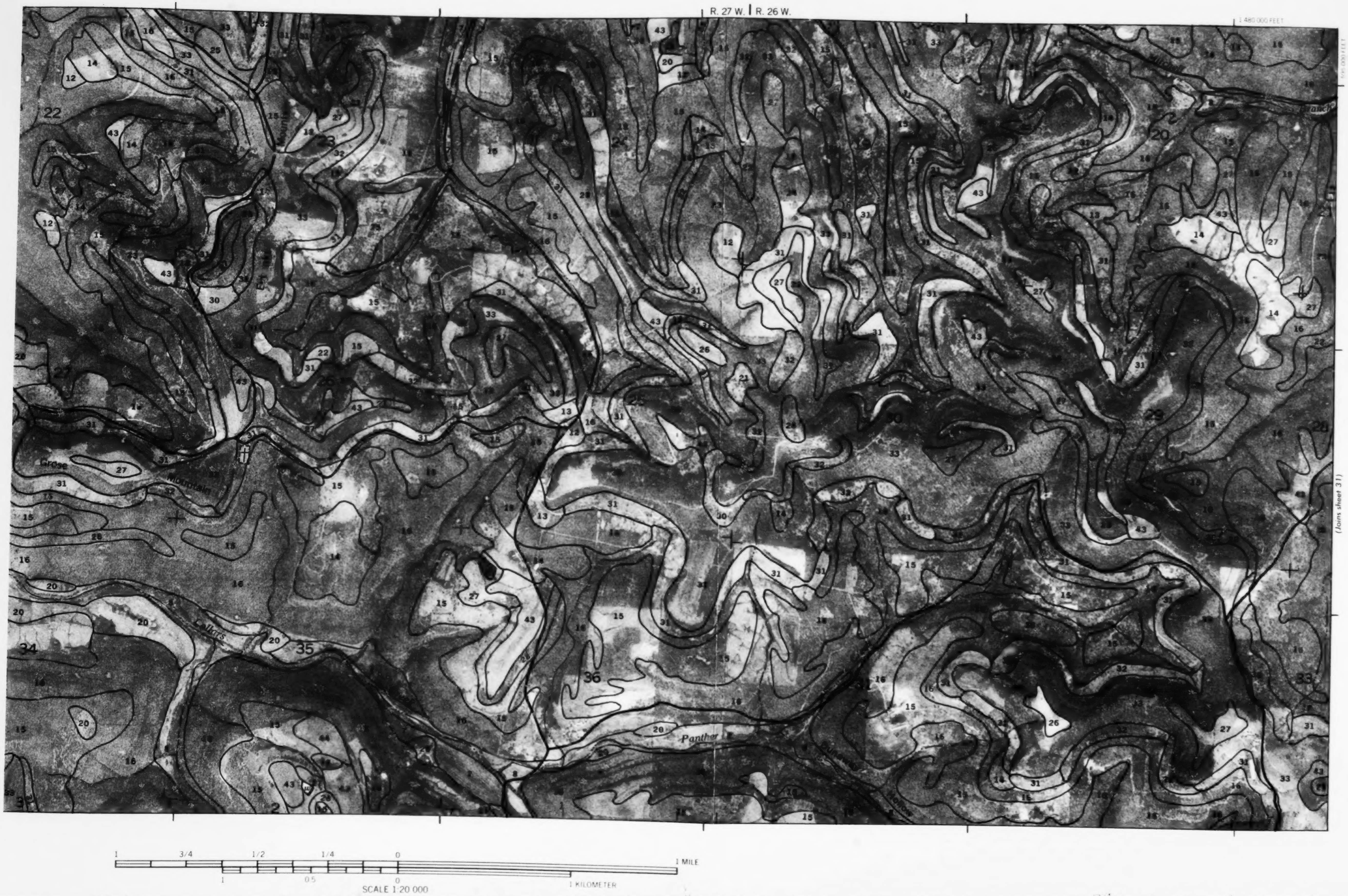
N

(Joins sheet 25)

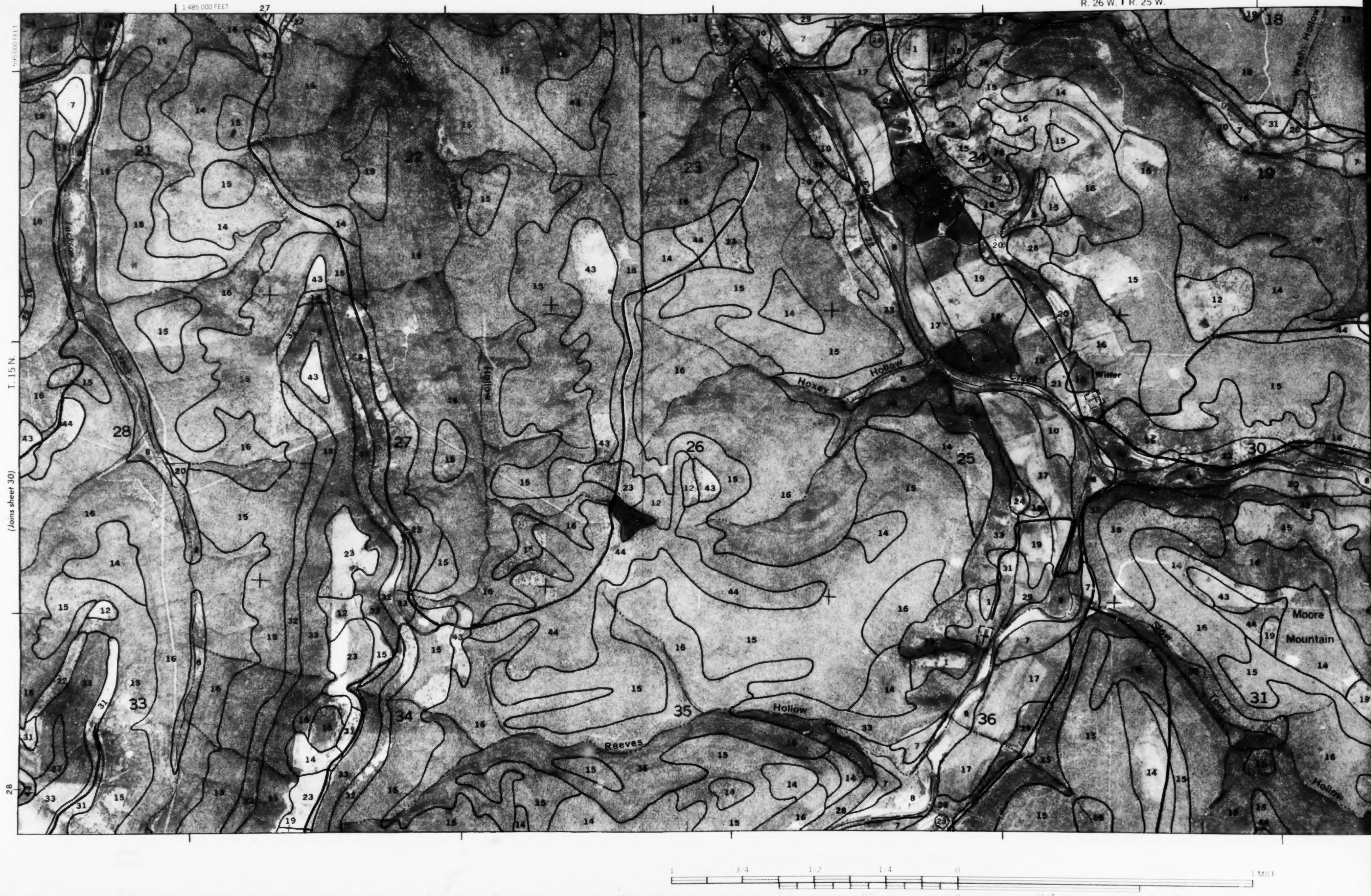

R. 27
(Joins sheet 29)
Potato
Lacy Mountain
Ridley
Hollow
Lacy Mountain
Rowe Hollow
Grase Mountain
Callars
Mountain
20
21
22
23
24
26
27
28
33
34
35
36
5
2
585 000 FEET
1 445 000 FEET
T. 14 N. | T. 15 N.

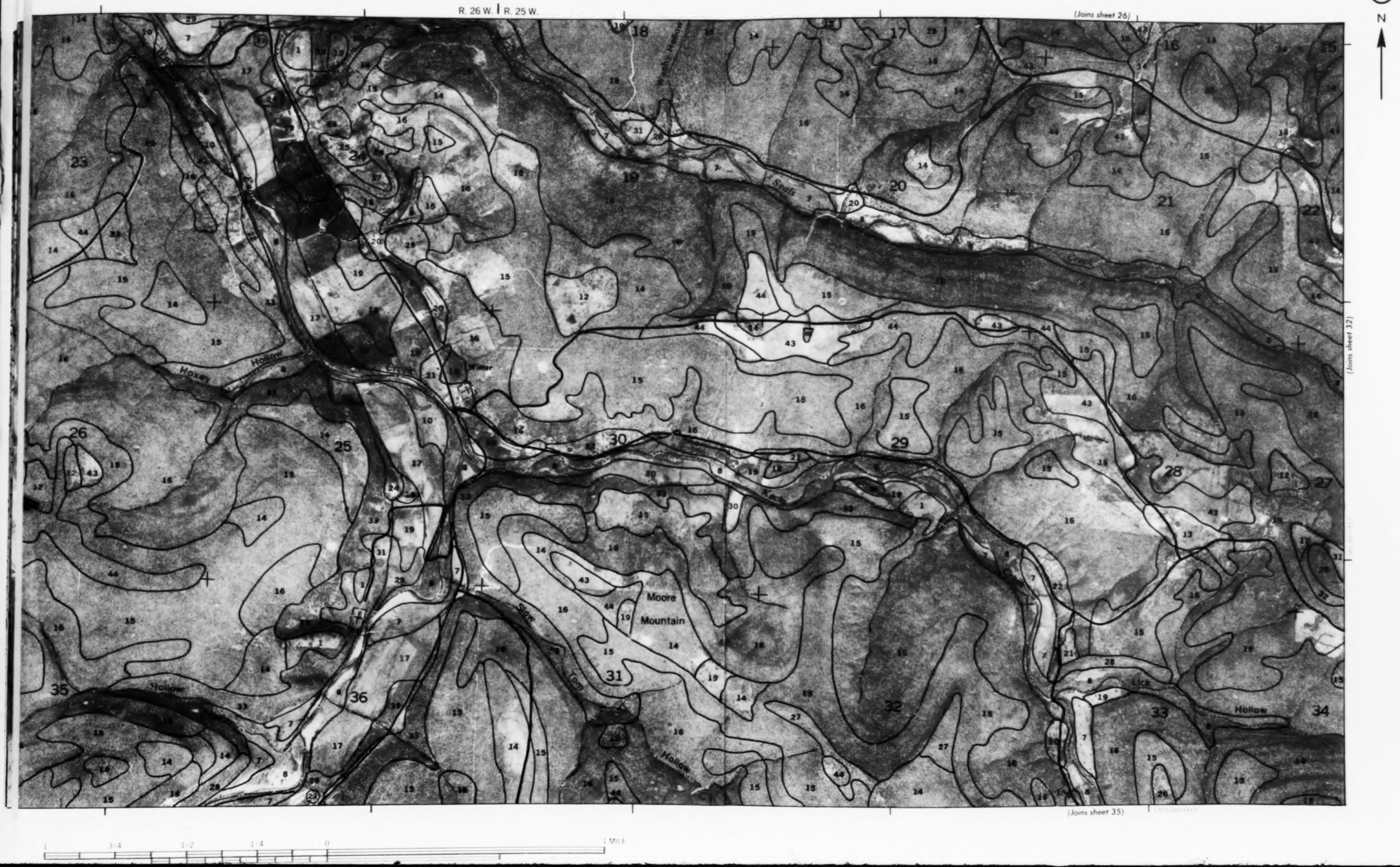
(Joins sheet 34)

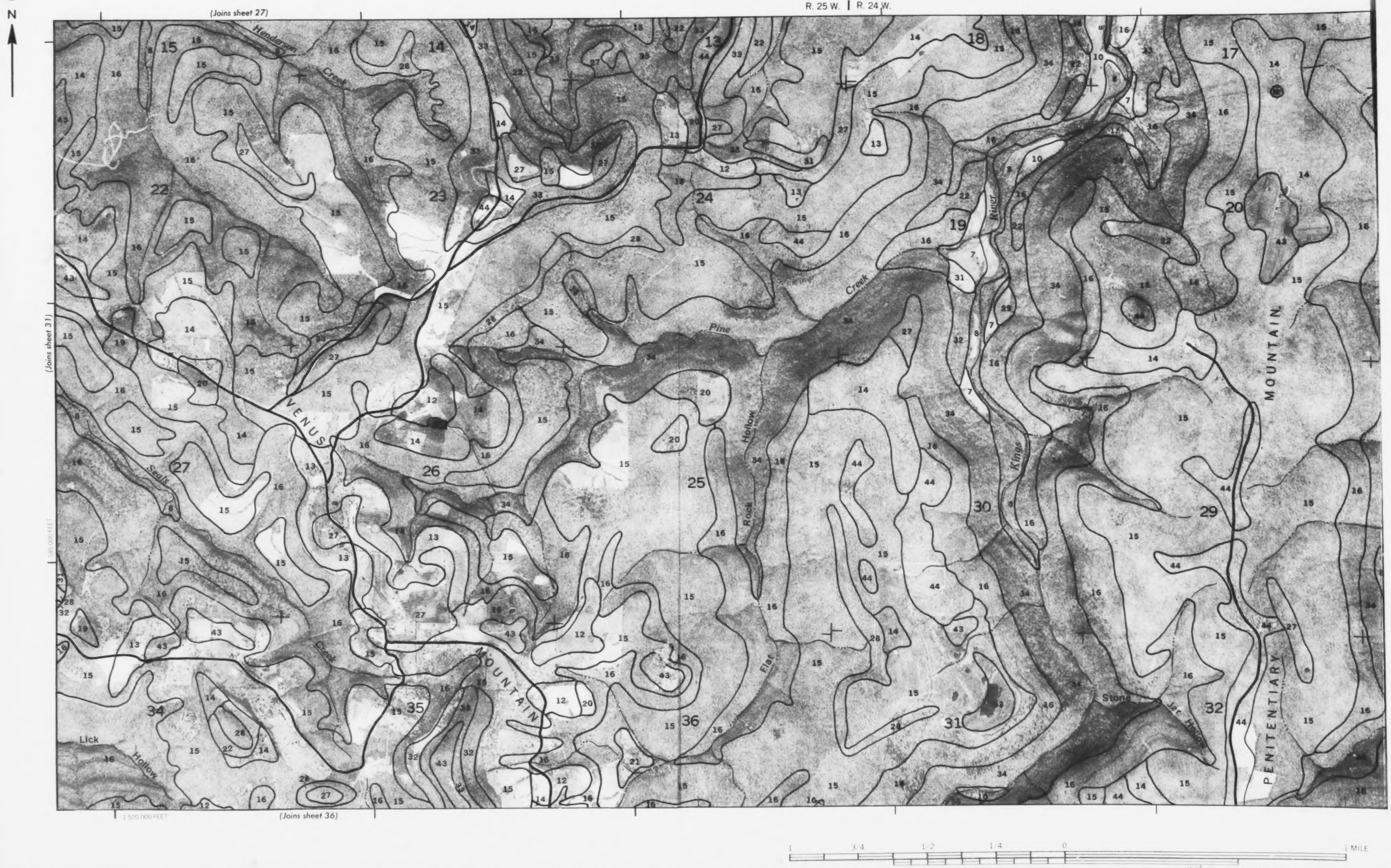
MADISON COUNTY, ARKANSAS — SHEET NUMBER 30



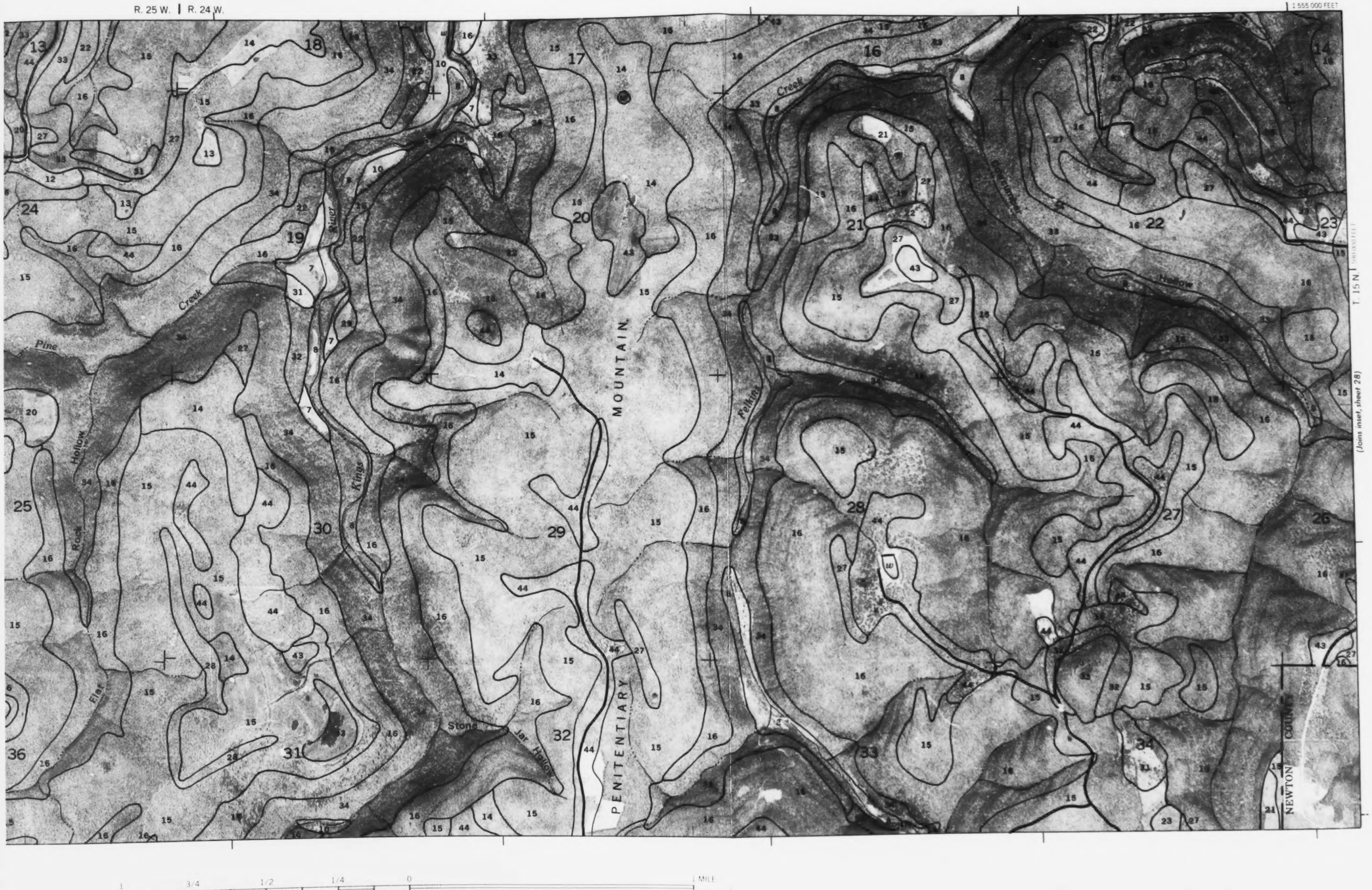
R. 27 W.
R. 26 W.
1 480 000 FEET
(Joins sheet 31)
Grose
Mountain
Collins
Panther
22
23
24
20
21
27
26
25
29
28
34
35
36
31
32
33
SCALE 1:20 000
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER


1 485 000 FEET
R. 26 W. | R. 25 W.
T. 15 N.
(Joins sheet 30)
21
22
23
24
19
28
27
26
25
30
33
34
35
36
31
Hoxey Hollow
Creek
Reeves Hollow
Moore Mountain
Hollow
1
3/4
1/2
1/4
0
1 Mile

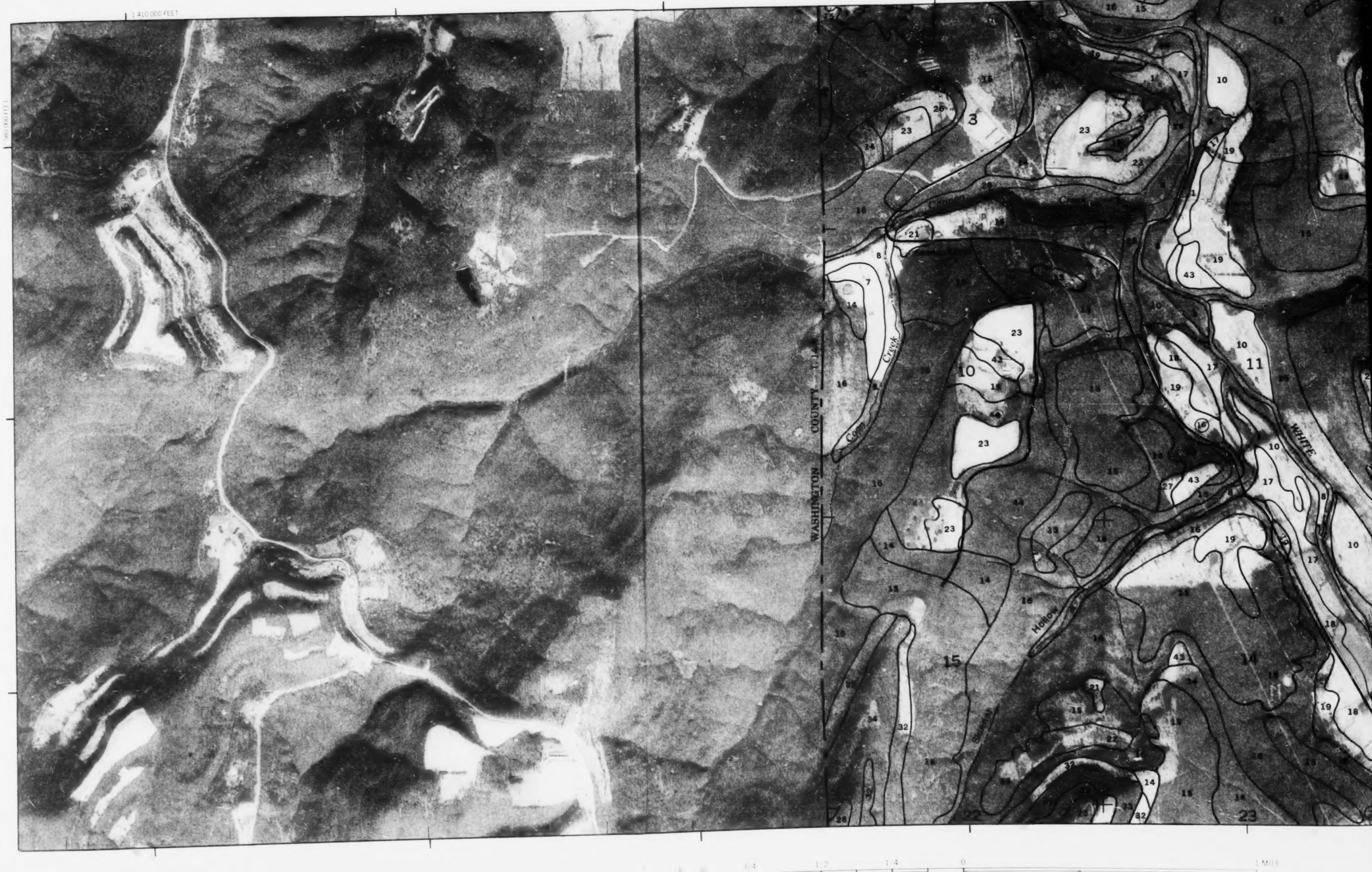

R. 26 W.
R. 25 W.
(Joins sheet 26)
(Joins sheet 32)
(Joins sheet 35)
N
Hoxey
Hollow
Seals
Creek
Kings
Moore
Mountain
Tom
Hollow
Lick
Hollow
18
17
16
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
1
3/4
1/2
1/4
0
1 MILE


N
(Joins sheet 27)
R. 25 W. | R. 24 W.
(Joins sheet 31)
(Joins sheet 36)
1 520 000 FEET
Henderson Creek
VENUS
Seals Creek
Creek
MOUNTAIN
Pine Creek
Rock Hollow
Flat
Kings River
MOUNTAIN
PENITENTIARY
Stone Jar Hollow
Lick Hollow
13
14
15
17
18
19
20
22
23
24
25
26
27
29
30
31
32
34
35
36
1
3/4
1/2
1/4
0
1 MILE

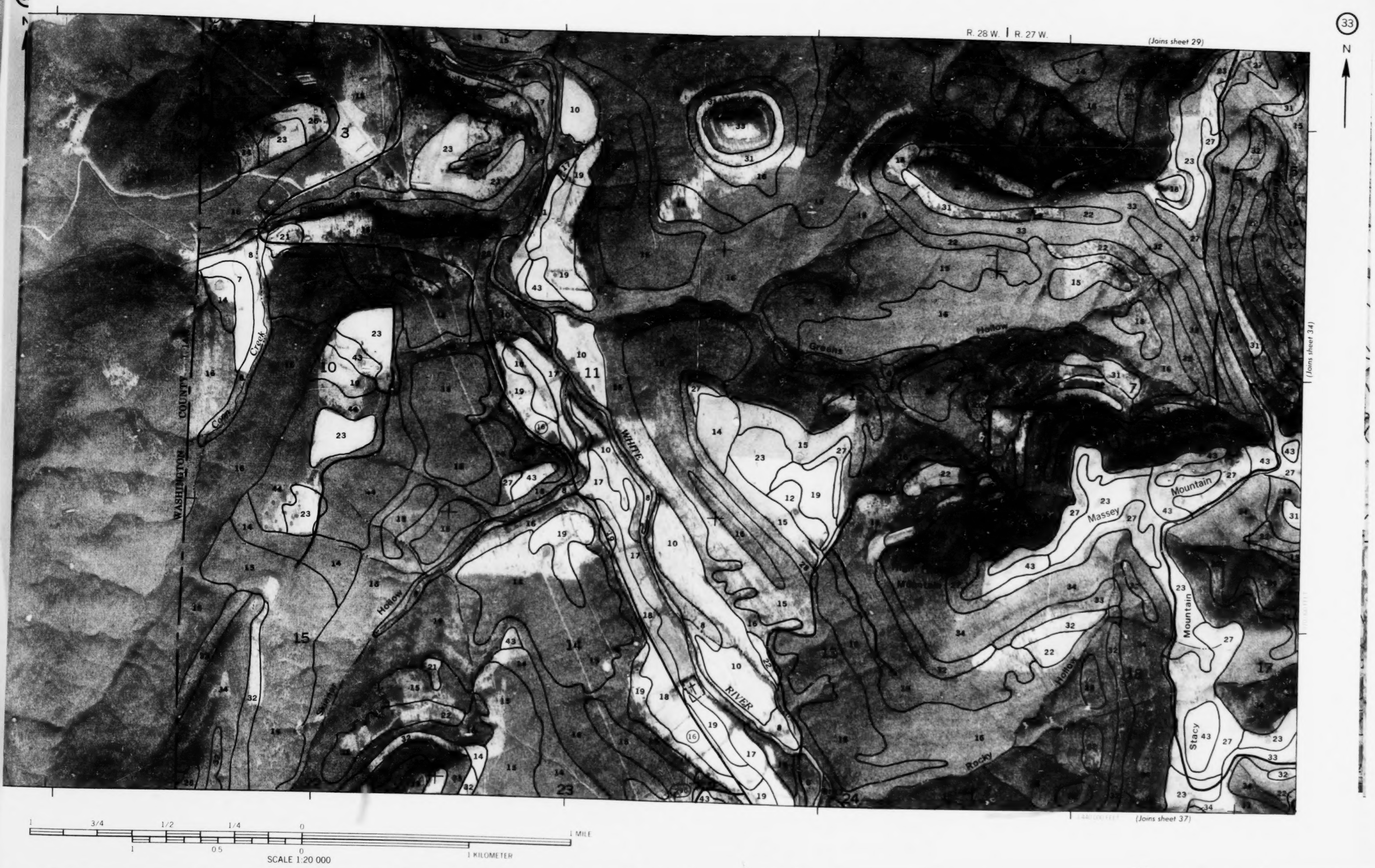
MADISON COUNTY, ARKANSAS — SHEET NUMBER 32



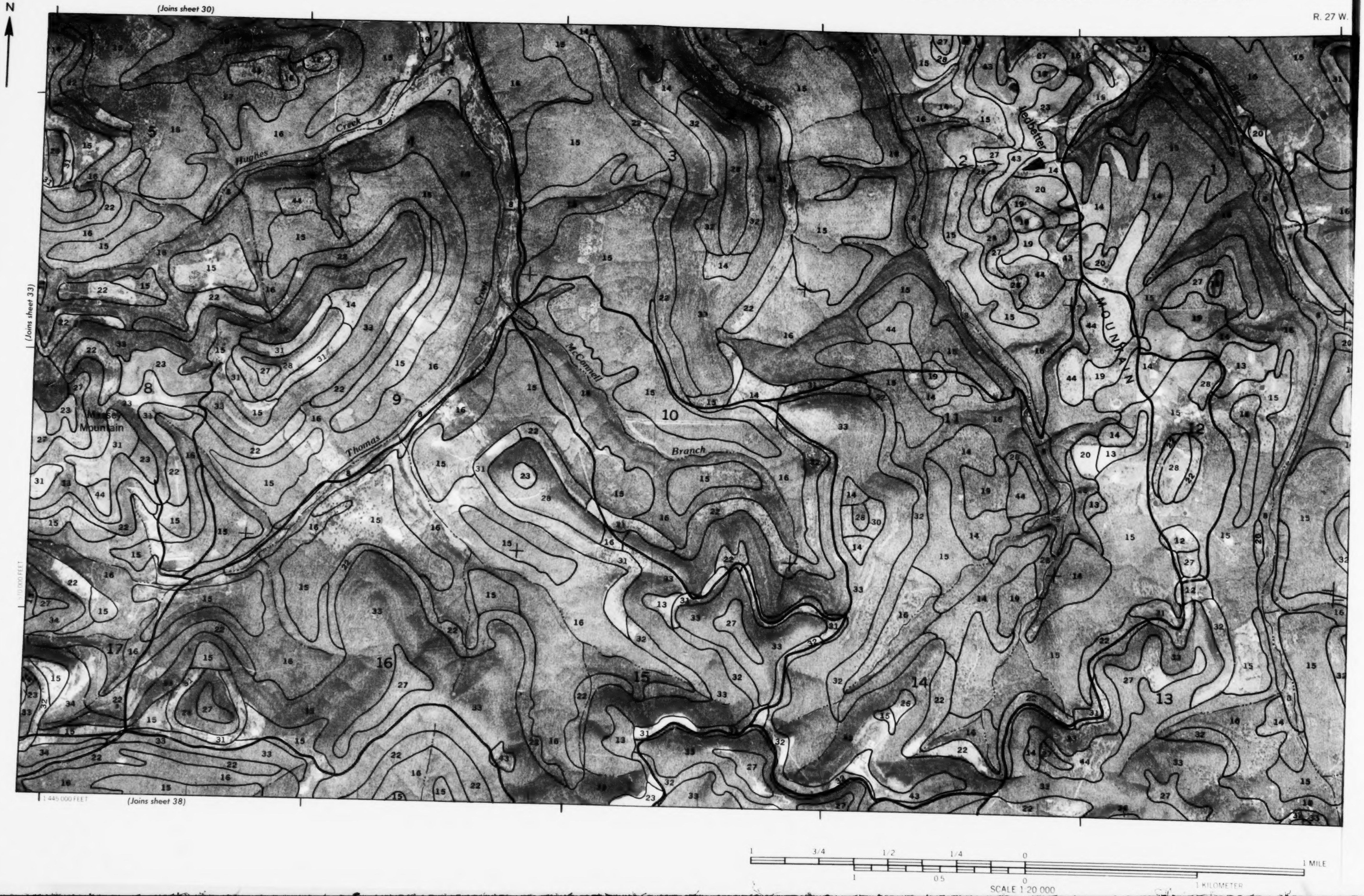
R. 25 W.
R. 24 W.
1 555 000 FEET
T. 15 N.
(Joins inset, sheet 28)
Pine Creek
Rock Hollow
Flat
Kings River
Stone Jar Hollow
PENITENTIARY MOUNTAIN
Felkins Creek
Hollow
NEWTON COUNTY
13
18
17
16
14
24
19
20
21
22
23
25
30
29
28
27
26
36
31
32
33
34
1
3/4
1/2
1/4
0
1 MILE


1 410 000 FEET
WASHINGTON COUNTY
Coon Creek
Coon
Hollow
WHITE
3
10
11
14
15
22
23
0
1/4
1/2
3/4
1 MILE

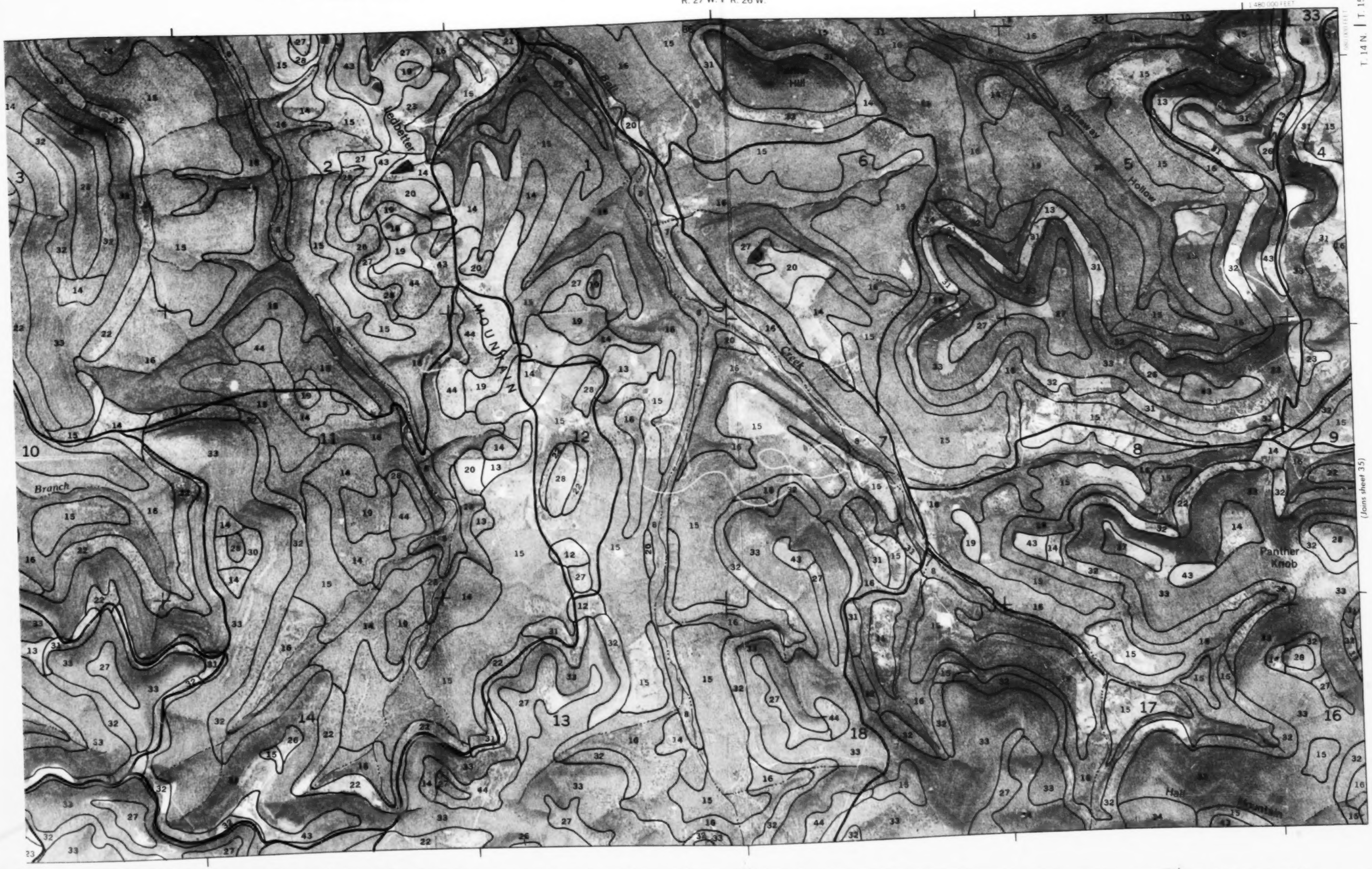
MADISON COUNTY, ARKANSAS — SHEET NUMBER 33


33
N
R. 28 W. | R. 27 W.
(Joins sheet 29)
(Joins sheet 34)
(Joins sheet 37)
WASHINGTON COUNTY
MADISON COUNTY
Corn Creek
Hollow
Greens Hollow
WHITE RIVER
Massey Mountain
Mountain
Stacy
Rocky Hollow
3
7
10
11
14
15
17
23
24
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

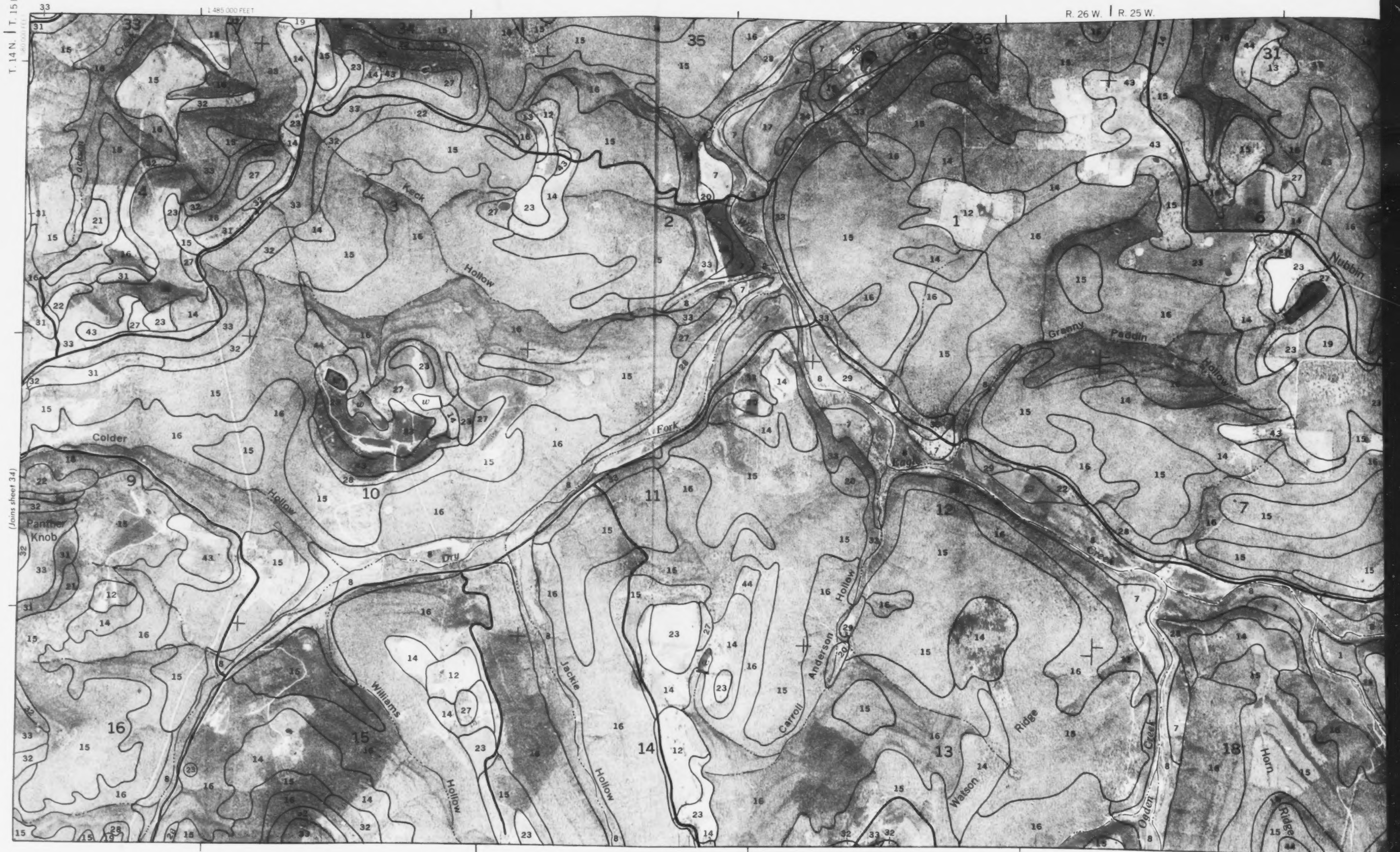
MADISON COUNTY, ARKANSAS — SHEET NUMBER 34


N
(Joins sheet 30)
R. 27 W.
(Joins sheet 33)
(Joins sheet 38)
370 000 FEET
1 445 000 FEET
Hughes Creek
Thomas Creek
McConnell Branch
Massey Mountain
Ledbetter Mountain
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 34


R. 27 W. | R. 26 W.
T. 14 N. | T. 15 N.
1 480 000 FEET
(Joins sheet 35)
Ledbetter
MOUNTAIN
Ball
Creek
Hill
Hollow
Branch
Panther Knob
Hall Mountain
1
2
3
4
5
6
7
8
9
10
11
12
13
14
16
17
18
33

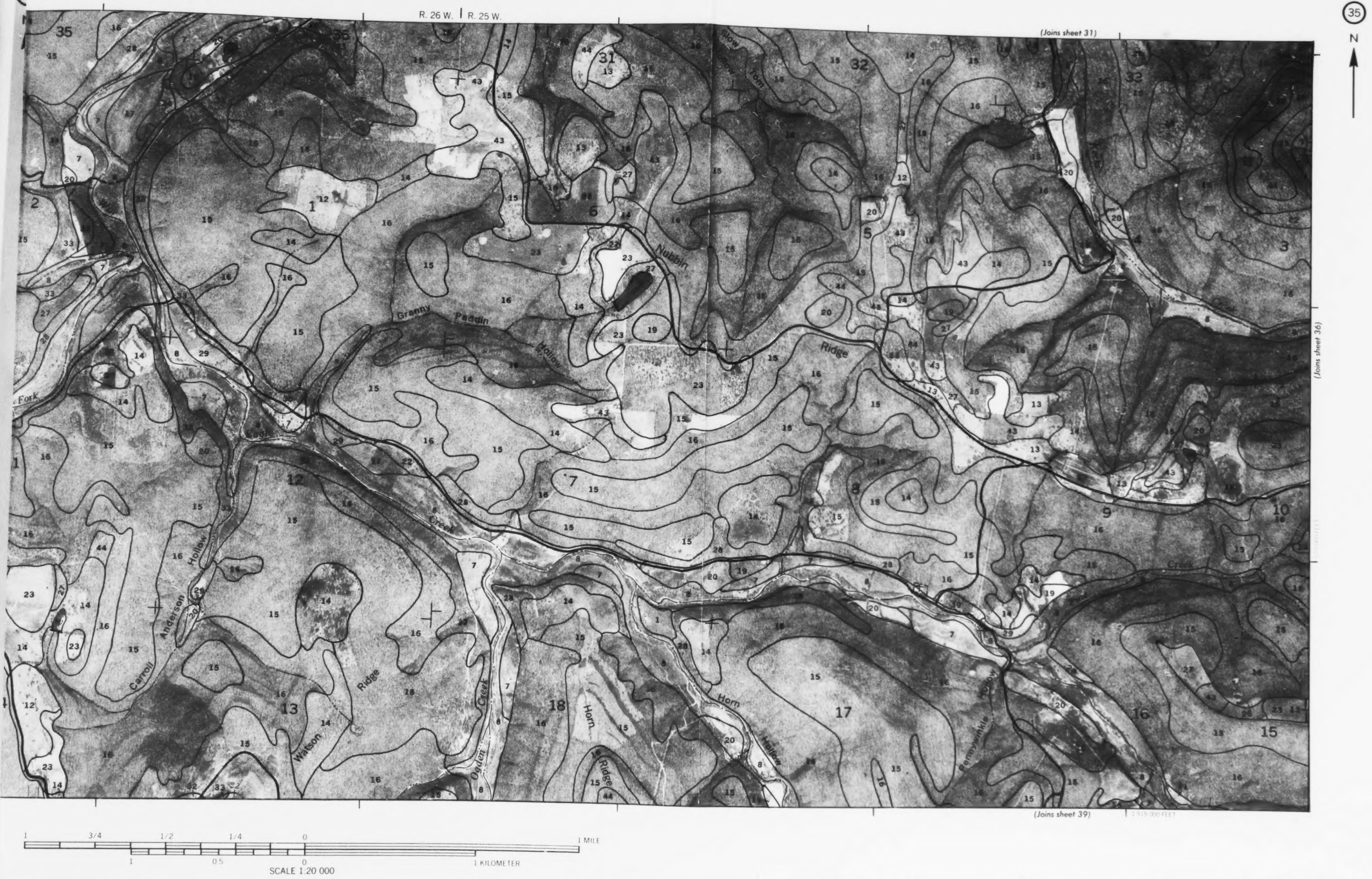
MADISON COUNTY, ARKANSAS NO. 35

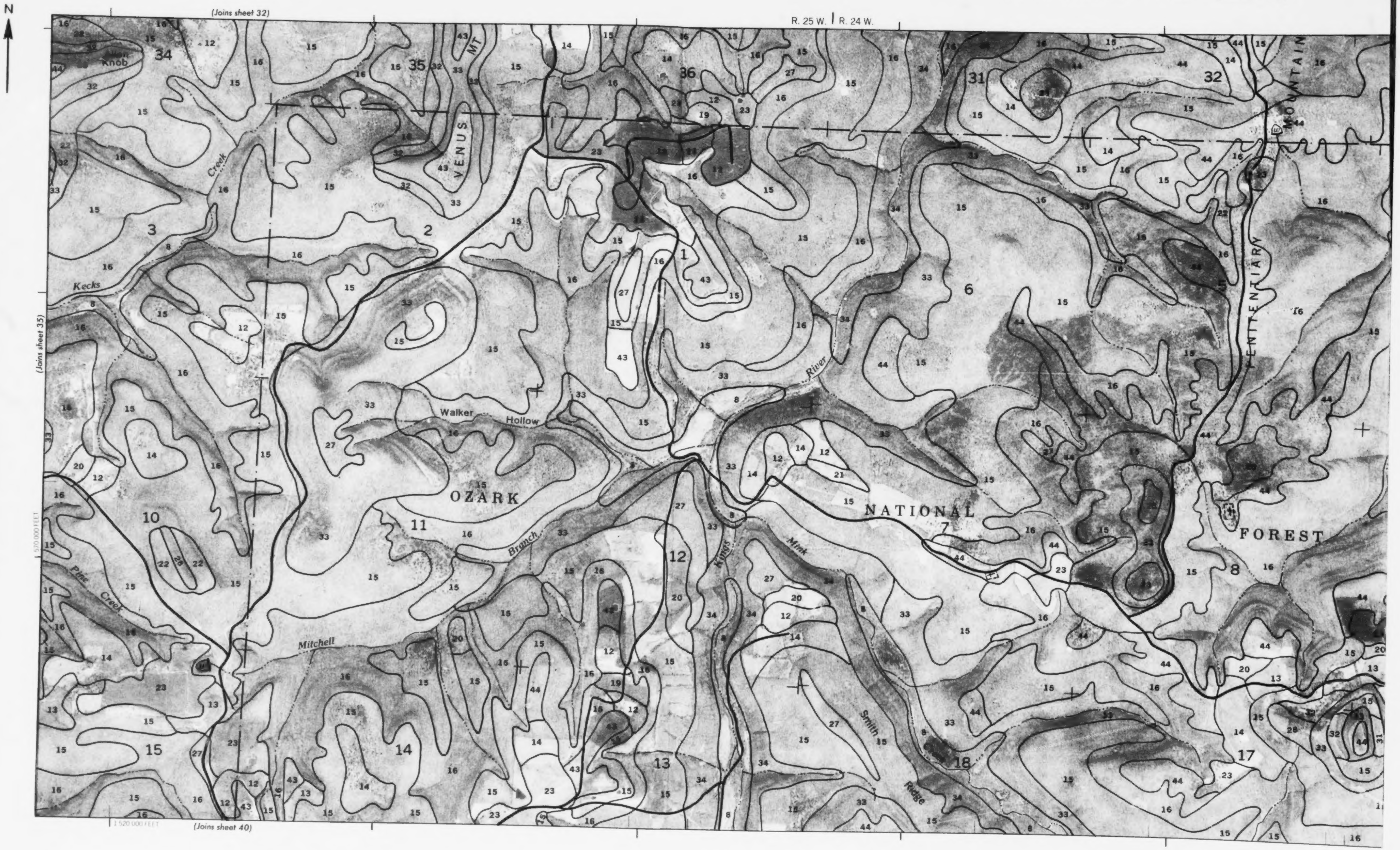

T. 14 N. | T. 15 N.
1 485 000 FEET
R. 26 W. | R. 25 W.
(Joins sheet 34)
Keck
Hollow
Colder
Hollow
Panther Knob
Fork
Dry
Williams
Hollow
Jackie
Hollow
Carroll
Anderson
Hollow
Watson
Ridge
Ogden
Creek
Granny
Paddin
Hollow
Nubbin
Kings
Creek
Horn
Ridge
33
4
3
2
35
36
1
31
6
9
10
11
12
7
16
15
14
13
18

1 3/4 1/2 1/4 0 1 MILE

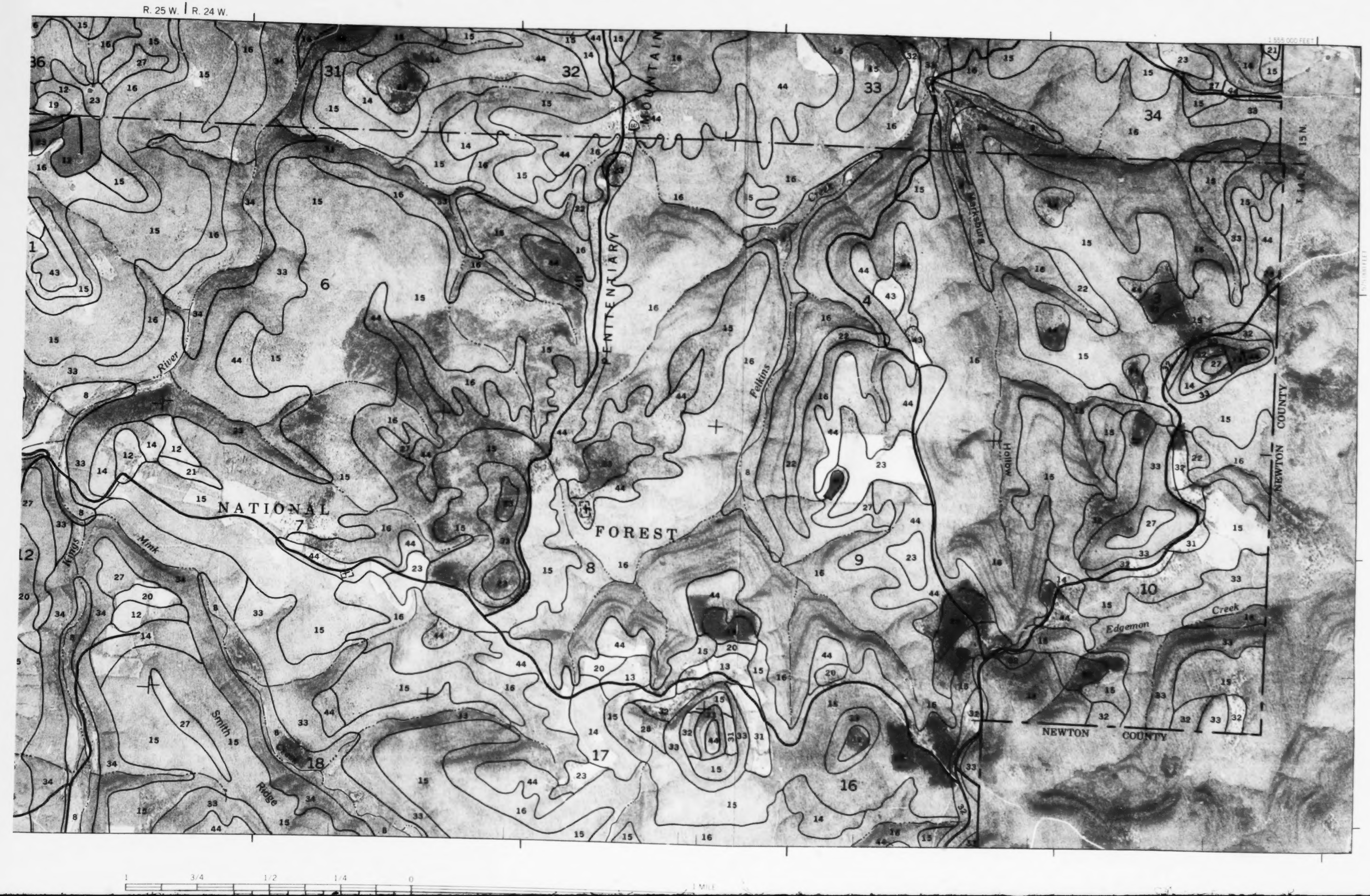
1 0.5 0 1 KILOMETER

SCALE 1:20 000

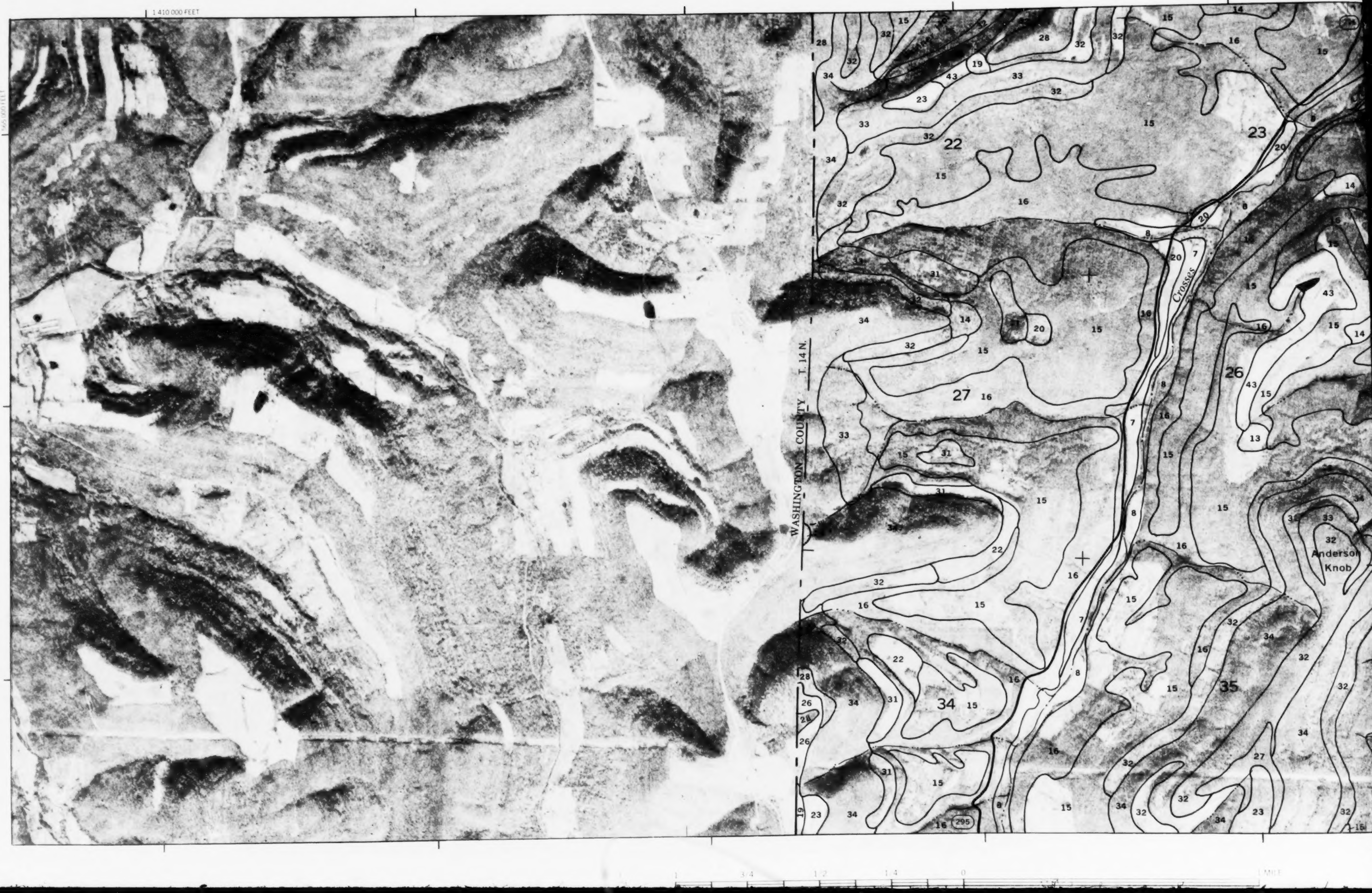

R. 26 W.
R. 25 W.
35
N
(Joins sheet 31)
(Joins sheet 36)
(Joins sheet 39)
Granny
Paddin
Hollow
Nubbin
Ridge
Slow
Hollow
Tom
Fork
Creek
Anderson
Hollow
Carroll
Ridge
Watson
Ogden
Creek
Horn
Ridge
Horn
Hollow
Bennywinkle
Hollow
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 32)
R. 25 W. | R. 24 W.
(Joins sheet 35)
(Joins sheet 40)
570 000 FEET
1 520 000 FEET
Allen Knob
VENUS MT
Creek
Kecks
Walker Hollow
OZARK NATIONAL FOREST
Branch
Pine Creek
Mitchell
River
Kings
Mink
Smith Ridge
PENITENTIARY MOUNTAIN
34
35
36
31
32
3
2
1
6
5
10
11
12
7
8
15
14
13
18
17

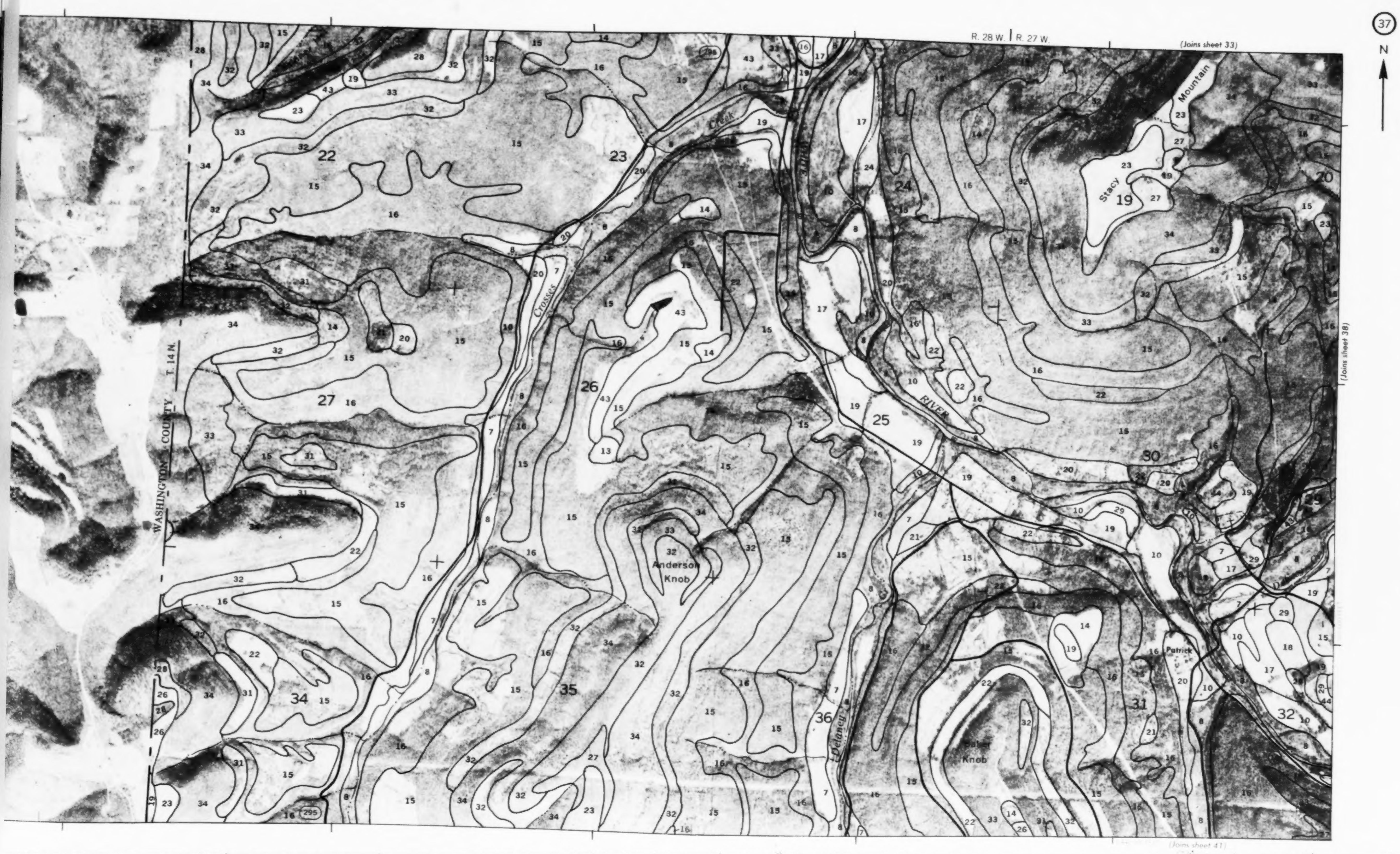
MADISON COUNTY, ARKANSAS — SHEET NUMBER 36


R. 25 W.
R. 24 W.
PENITENTIARY
MOUNTAIN
NATIONAL
FOREST
River
Kings
Mink
Smith
Ridge
Creek
Felkins
Creek
Hollow
Edgemon
Creek
NEWTON COUNTY
NEWTON
COUNTY
T. 15 N.
1,555,000 FEET
36
31
32
33
34
1
6
4
3
2
12
7
8
9
10
11
18
17
16
15
1
3/4
1/2
1/4
0
1 MILE

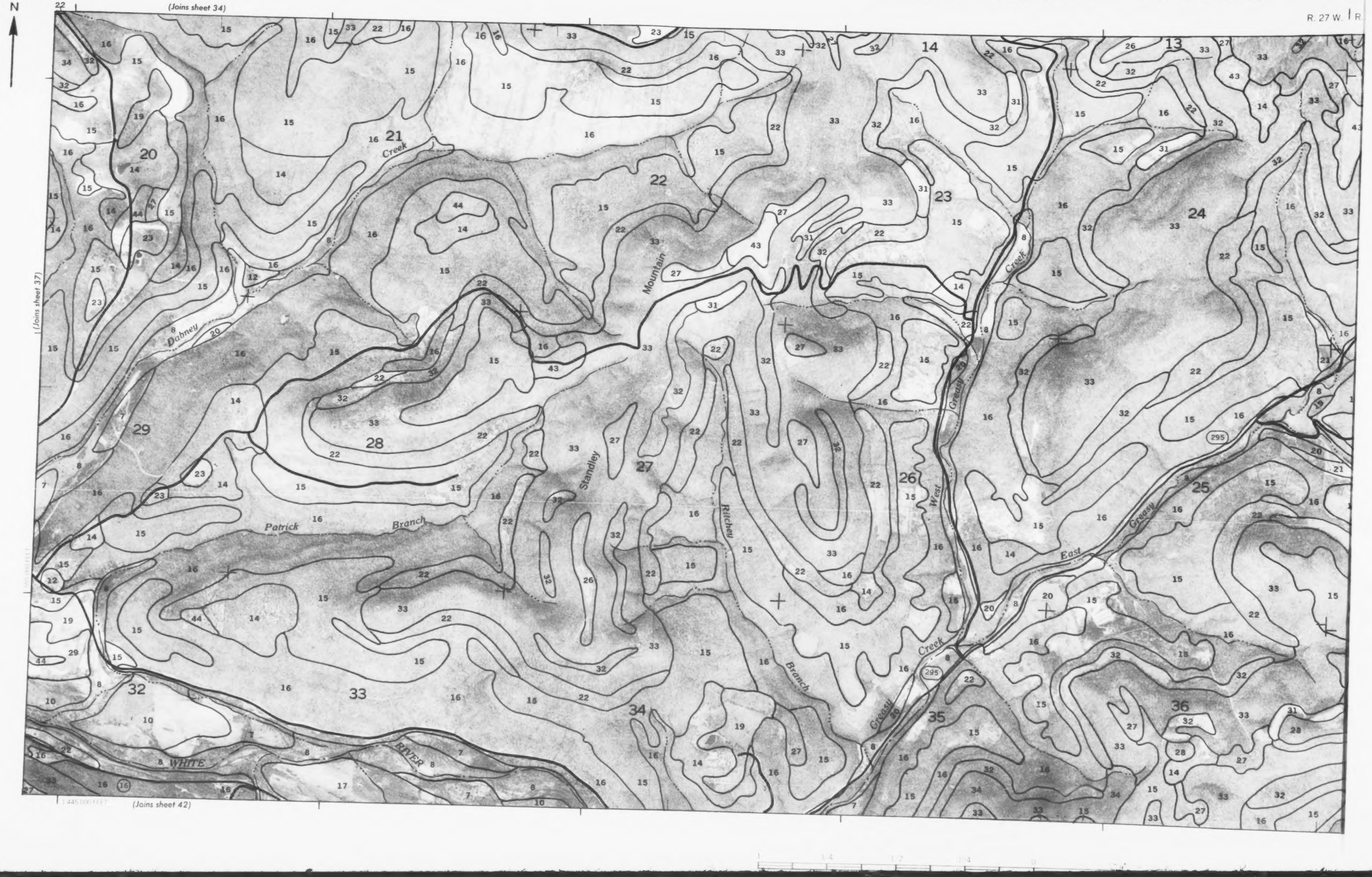
MADISON COUNTY, ARKANSAS NO. 37


1 410 000 FEET
165 000 FEET
WASHINGTON COUNTY
T. 14 N.
Crosses
Anderson Knob
22
23
26
27
34
35
295
1
3/4
1/2
1/4
0
1 MILE

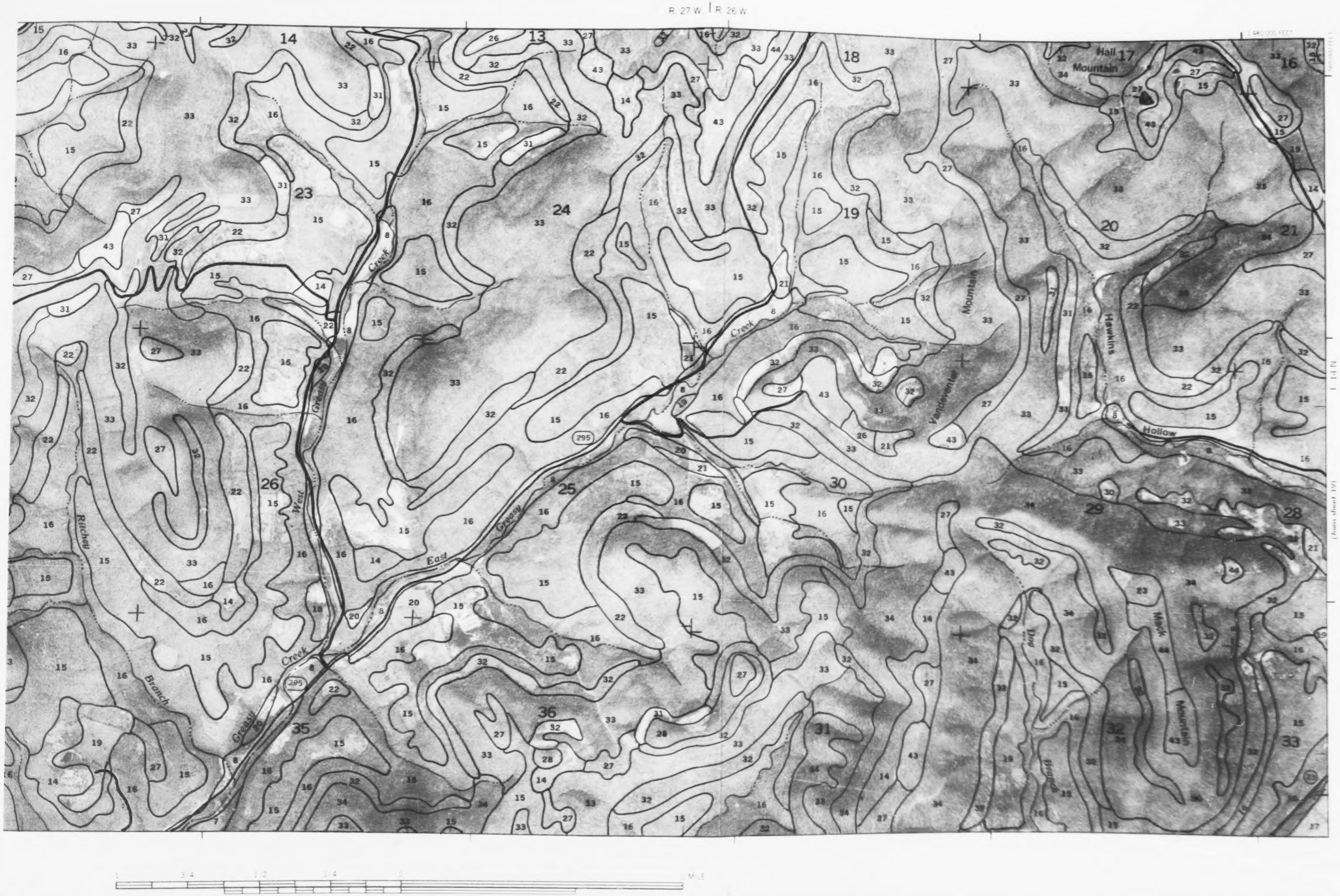
MADISON COUNTY, ARKANSAS — SHEET NUMBER 37

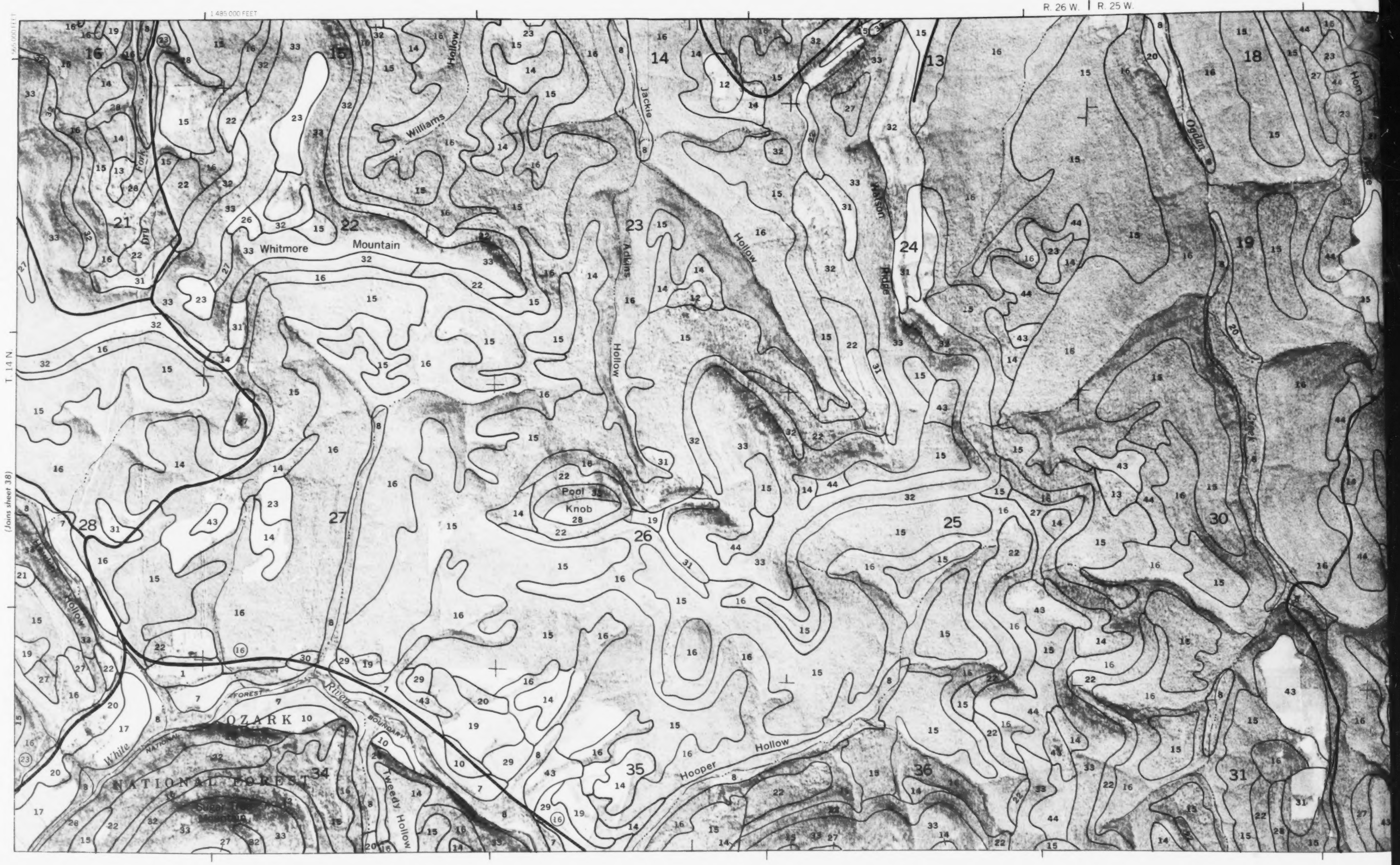

37
N
R. 28 W. | R. 27 W.
(Joins sheet 33)
(Joins sheet 38)
(Joins sheet 41)
WASHINGTON COUNTY
T. 14 N.
Stacy Mountain
Anderson Knob
Baker Knob
Patrick
Crosses Creek
River
Delaney
295
16

MADISON COUNTY, ARKANSAS — SHEET NUMBER 38

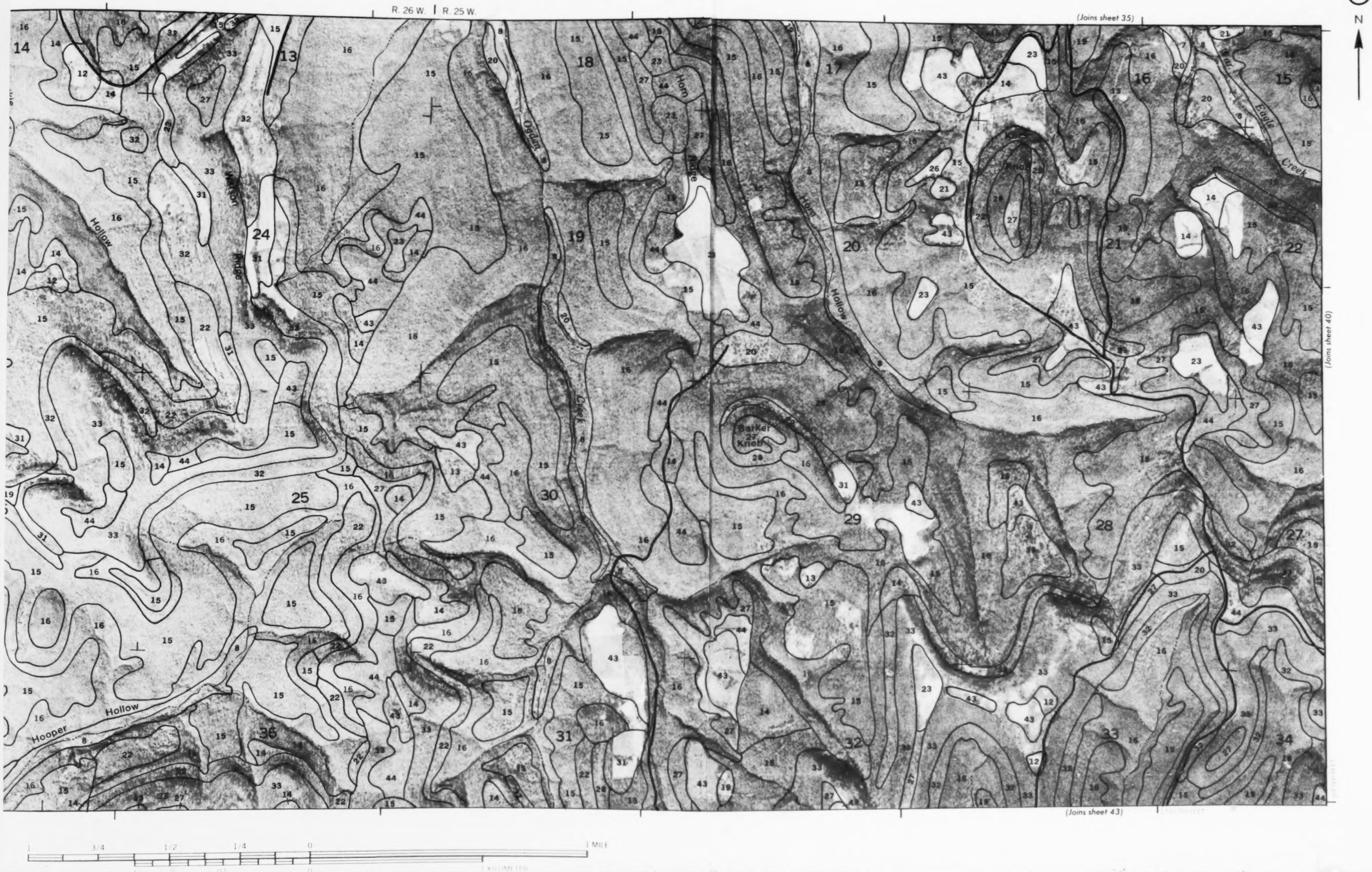

N
(Joins sheet 34)
(Joins sheet 37)
(Joins sheet 42)
R. 27 W.
22
13
14
20
21
22
23
24
25
26
27
28
29
32
33
34
35
36
Creek
Dabney
Mountain
Standley
Ritchey
Branch
Patrick
Branch
West
Greasy
Creek
East
Greasy
Creek
WHITE
RIVER
295
16
1 445 000 FEET
1
3/4
1/2
1/4
0

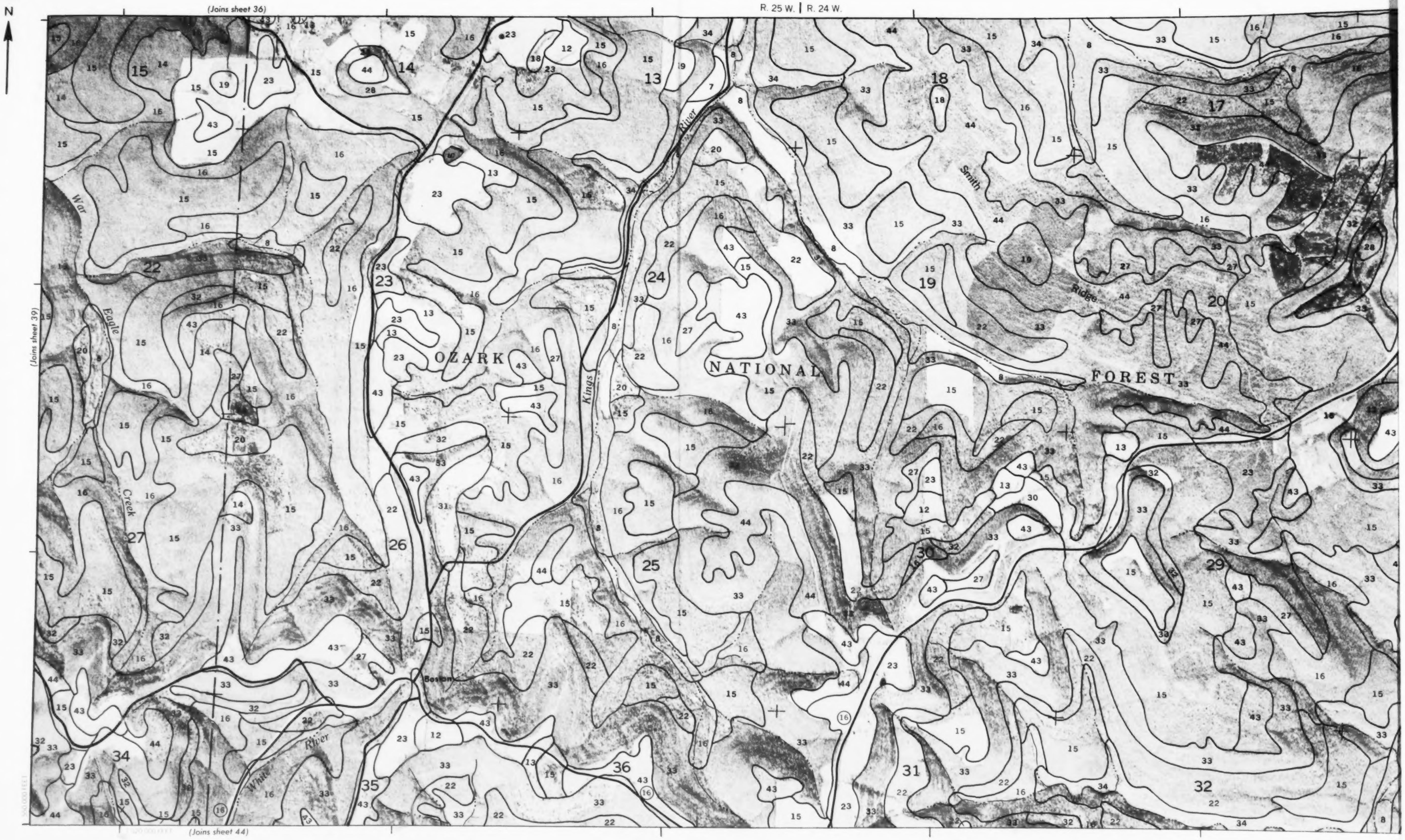
MADISON COUNTY, ARKANSAS — SHEET NUMBER 38


R. 27 W.
R. 26 W.
T. 14 N.
(Joins sheet 19)
Hall Mountain
Vandeventer Mountain
Hawkins Hollow
Mack Mountain
Dry Branch
Richey Branch
West Greasy Creek
East Greasy Creek
Greasy Creek
295
1
3/4
1/2
1/4
0
MILE

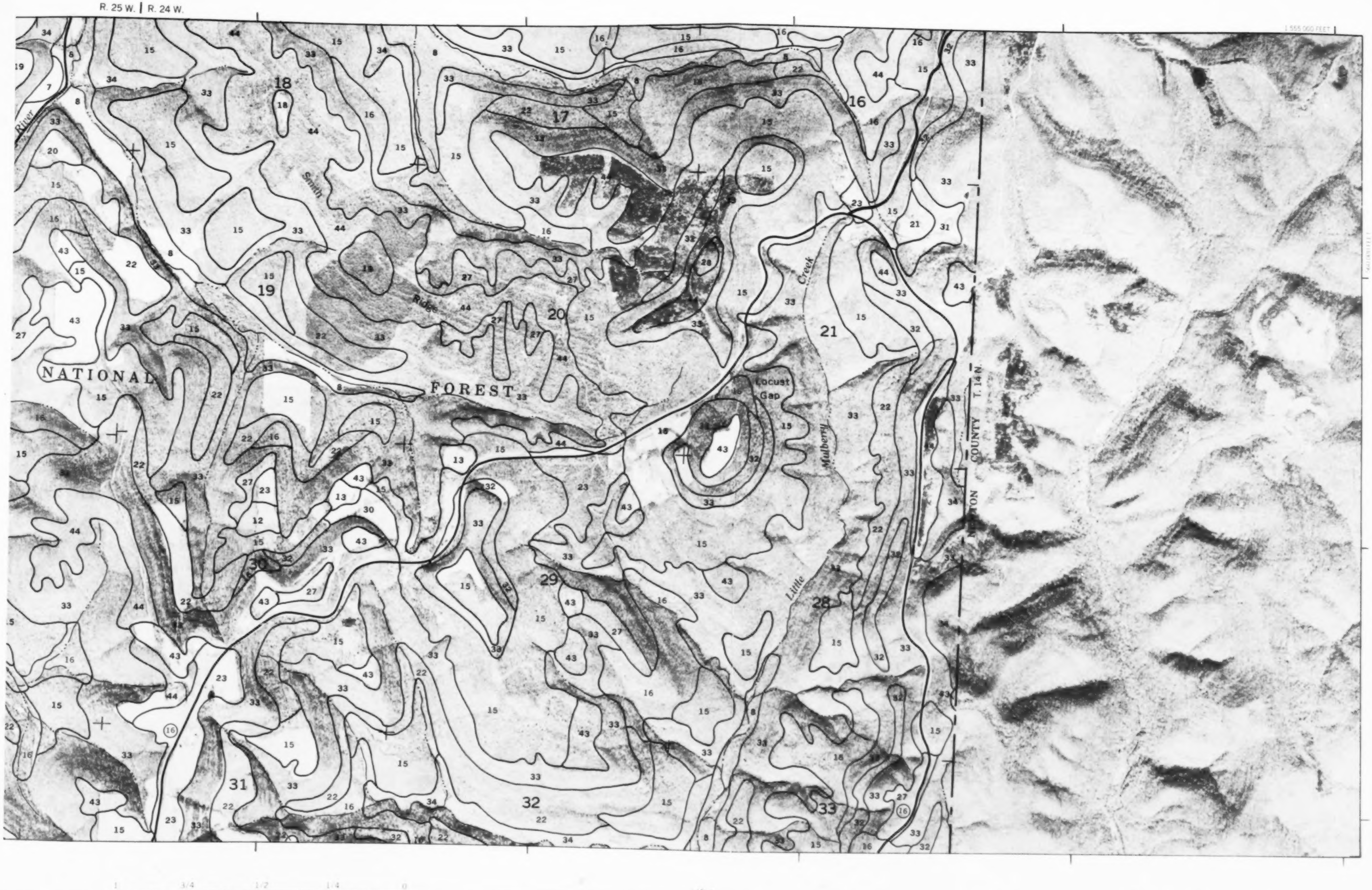

1 485 000 FEET
R. 26 W. | R. 25 W.
T. 14 N.
(Joins sheet 38)
Whitmore Mountain
Williams
Hollow
Dry Fork
Jackie
Adkins
Hollow
Hobson
Ridge
Hollow
Ogden
Creek
Pool Knob
Hooper Hollow
Tweedy Hollow
White River
OZARK NATIONAL FOREST
FOREST BOUNDARY
Sugar Tree Mountain
14
15
16
21
22
23
24
25
26
27
28
30
31
34
35
36

MADISON COUNTY, ARKANSAS — SHEET NUMBER 39


39
N
R. 26 W.
R. 25 W.
(Joins sheet 35)
(Joins sheet 40)
(Joins sheet 43)
Watson Ridge
Hollow
Ogden
Horn Ridge
Horn Hollow
Eagle Creek
Knob
Barker Knob
Creek
Hooper Hollow
13
14
17
18
19
20
21
22
24
25
27
28
29
30
31
32
33
34
36
1
3/4
1/2
1/4
0
1 MILE
0.5
1 KILOMETER

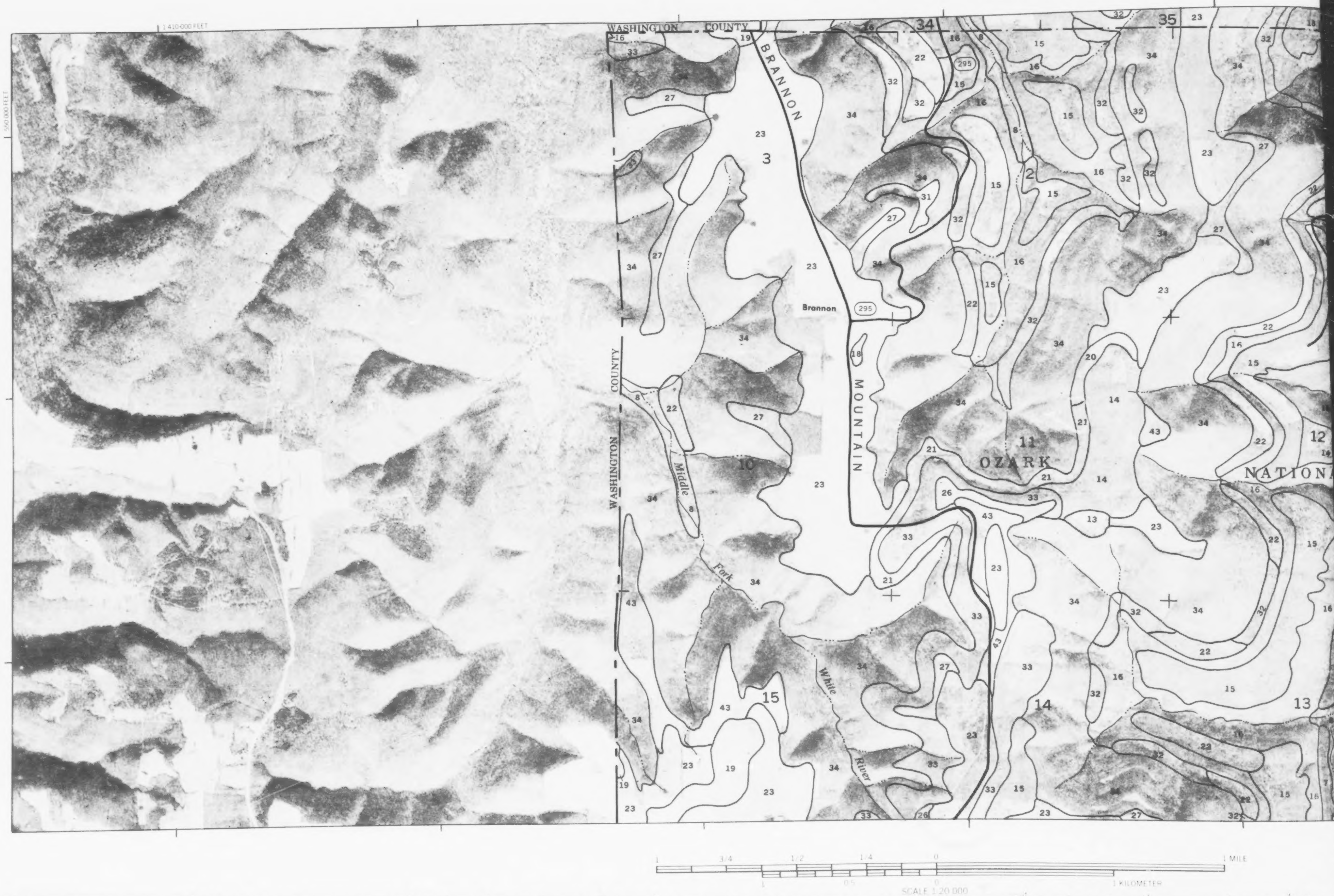

N
(Joins sheet 36)
R. 25 W. | R. 24 W.
(Joins sheet 39)
(Joins sheet 44)
OZARK NATIONAL FOREST
War Eagle Creek
Kings River
Smith Ridge
White River
Boston
16
13
14
15
17
18
19
20
22
23
24
25
26
27
29
30
31
32
34
35
36

MADISON COUNTY, ARKANSAS — SHEET NUMBER 40

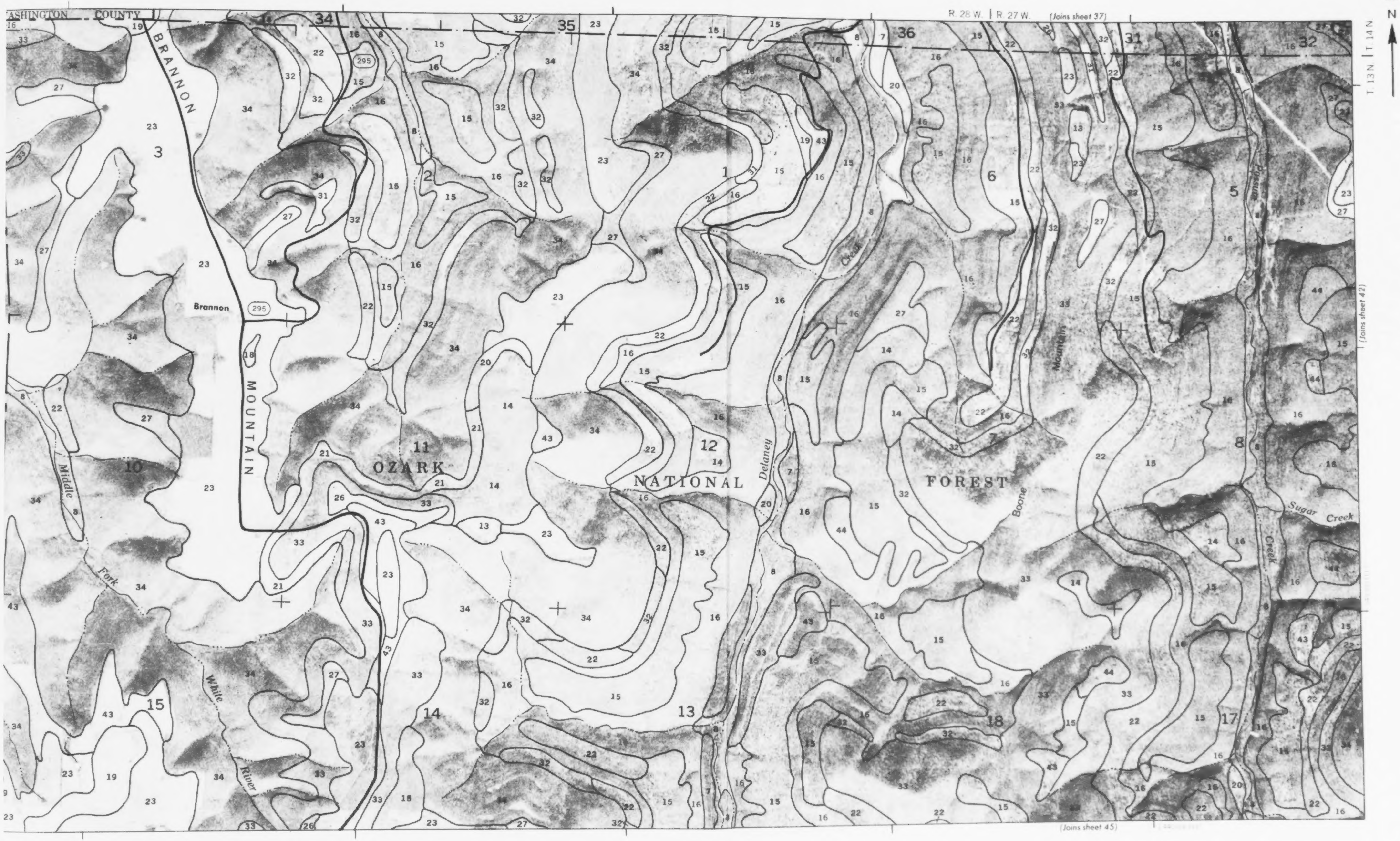

R. 25 W.
R. 24 W.
1 555 000 FEET
River
NATIONAL FOREST
Smith Ridge
Locust Gap
Little Mulberry Creek
NEWTON COUNTY
T. 14 N.
16
18
19
20
17
21
28
29
30
31
32
33
1
3/4
1/2
1/4
0

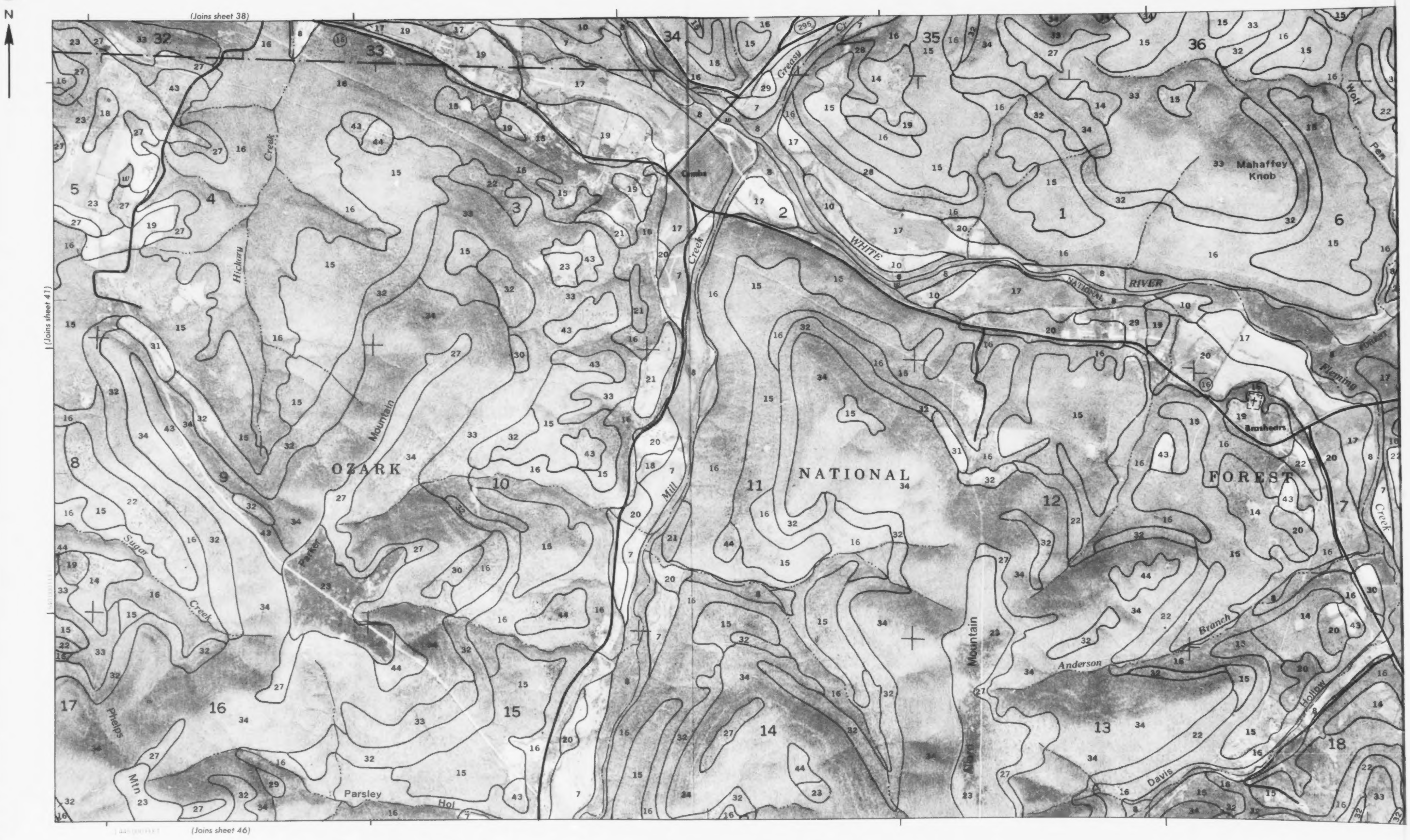
MADISON COUNTY, ARKANSAS NO. 40

MADISON COUNTY, ARKANSAS NO. 41

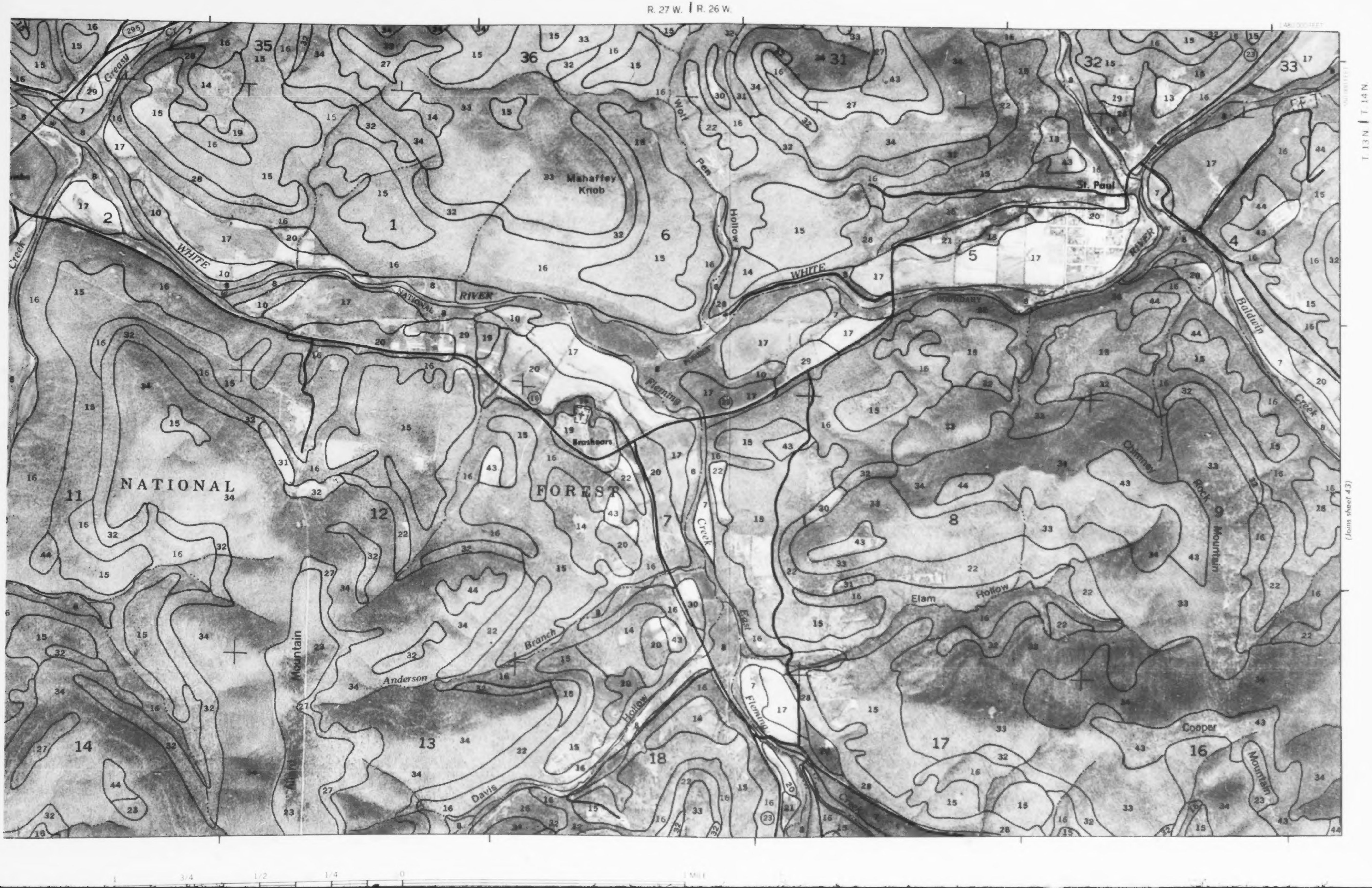

1 410 000 FEET
550 000 FEET
WASHINGTON COUNTY
WASHINGTON COUNTY
BRANNON MOUNTAIN
Brannon
295
OZARK
NATIONA
Middle Fork White River
34
35
3
2
10
11
12
13
14
15
1 MILE
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 41


WASHINGTON COUNTY
R. 28 W. | R. 27 W.
(Joins sheet 37)
N
T 14 N
T 13 N
(Joins sheet 42)
(Joins sheet 45)
BRANNON MOUNTAIN
Brannon
295
OZARK NATIONAL FOREST
Middle Fork White River
Delaney
Creek
Mountain
Boone
Sugar Creek
Creek
34
35
36
31
32
1
2
3
5
6
7
8
10
11
12
13
14
15
17
18


N
R. 27 W.
R. 26
(Joins sheet 38)
(Joins sheet 41)
(Joins sheet 46)
OZARK
NATIONAL
FOREST
WHITE
NATIONAL
RIVER
Mahaffey Knob
Hickory Creek
Mountain
Sugar Creek
Parker
Phelps
Mtn
Parsley
Hol
Mill Creek
Greasy Cr
Combs
Brashears
Fleming
Wolf Pen
Anderson
Branch
Davis
Hollow
Allard Mountain
Creek
295
16

MADISON COUNTY, ARKANSAS — SHEET NUMBER 42

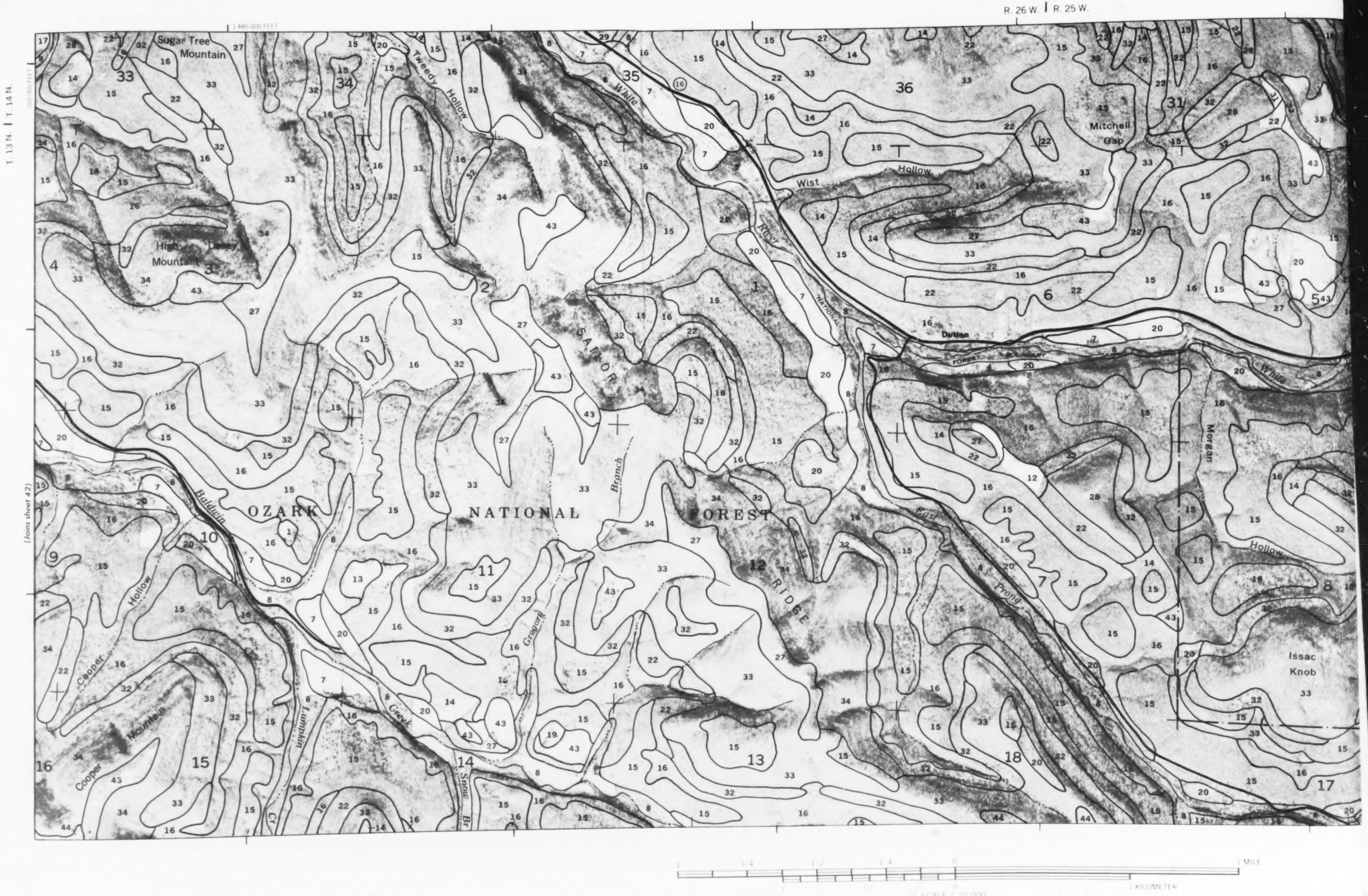

R. 27 W. | R. 26 W.
T. 13 N. | T. 14 N.
(Joins sheet 43)
Greasy Cr.
Creek
WHITE RIVER
NATIONAL
BOUNDARY
Mahaffey Knob
Wolf Pen Hollow
St. Paul
Baldwin Creek
Fleming
Brashears
NATIONAL FOREST
East Fleming Creek
Chimney Rock Mountain
Elam Hollow
Anderson Branch
Davis Hollow
Mountain
Cooper Mountain
1 2 4 5 6 7 8 9 11 12 13 14 16 17 18 31 32 33 35 36
1 3/4 1/2 1/4 0 1 MILE

MADISON COUNTY, ARKANSAS NO. 42

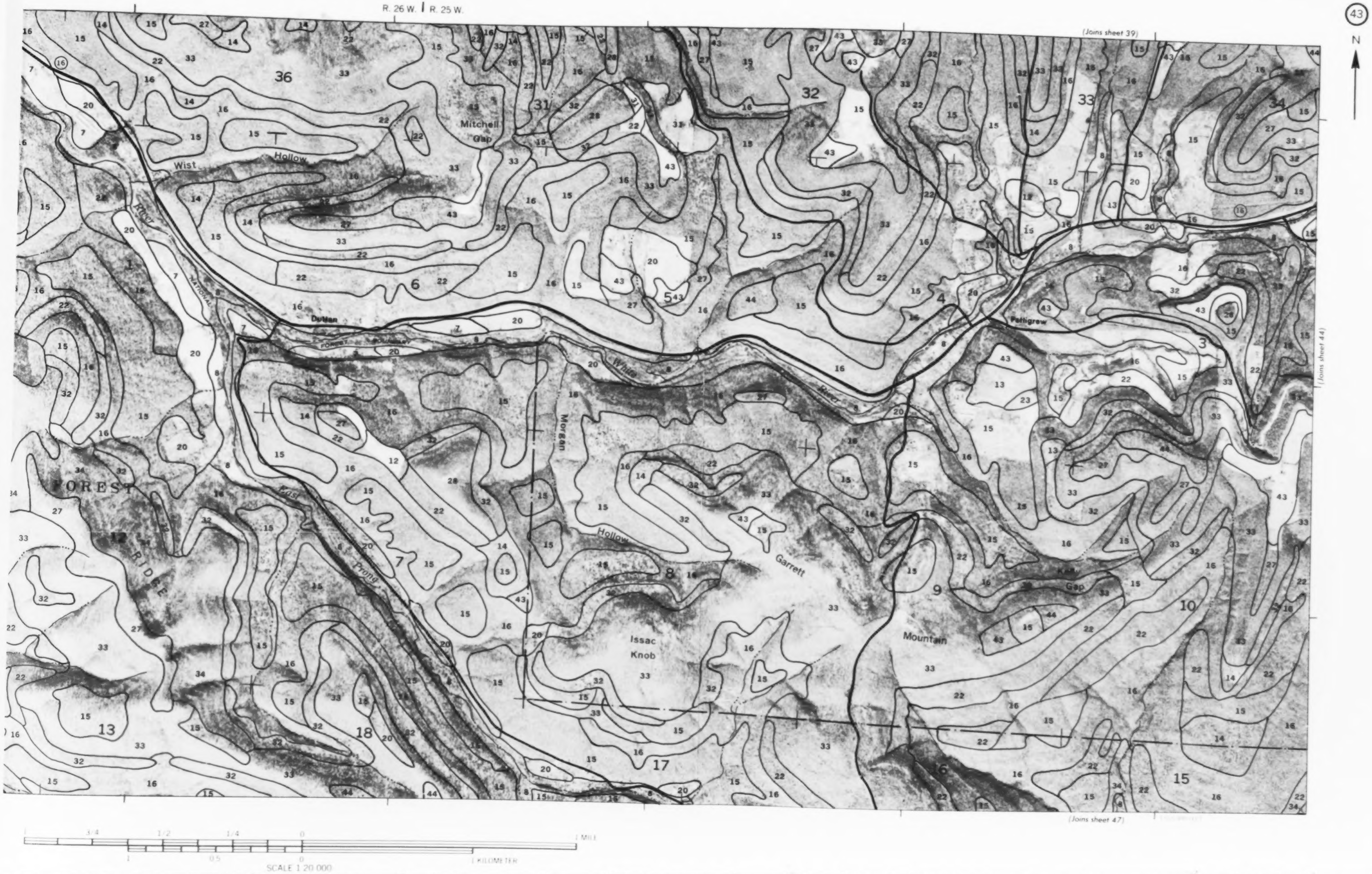
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating

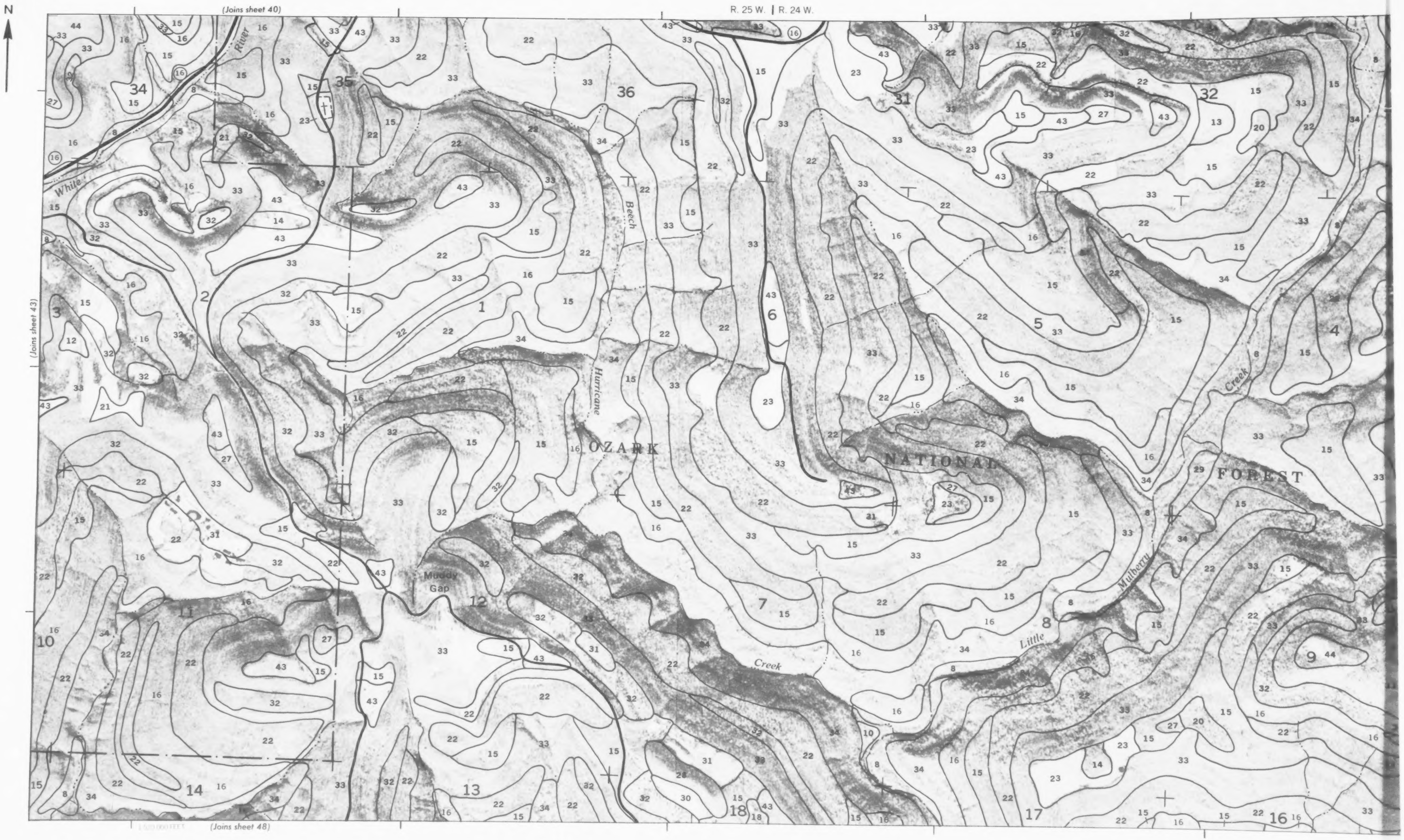
shown are approximately positioned

MADISON COUNTY, ARKANSAS NO. 43

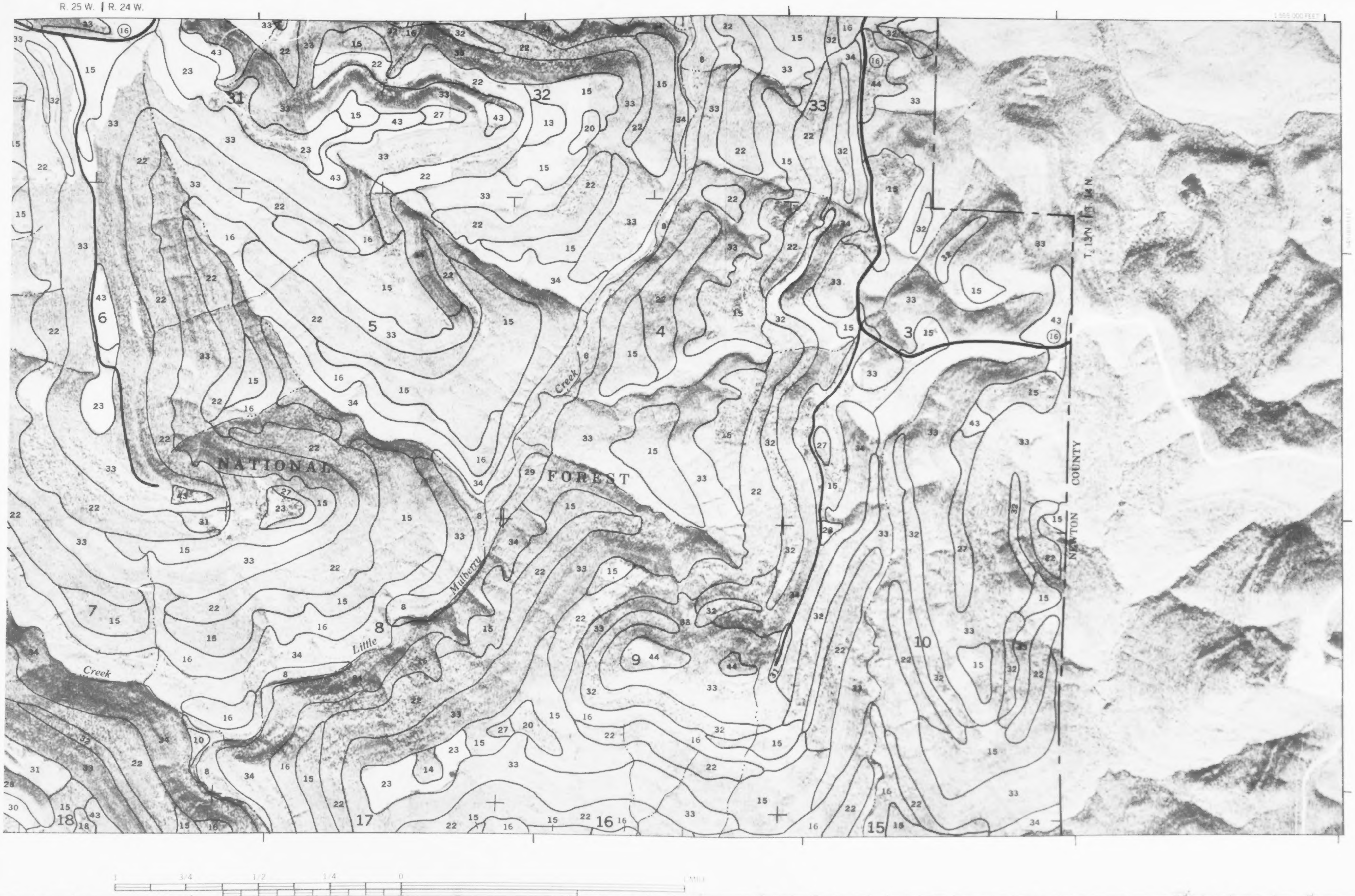

R. 26 W. | R. 25 W.
T. 13 N. | T. 14 N.
1 485 000 FEET
(Joins sheet 42)
Sugar Tree Mountain
Tweedy Hollow
White River
Wist Hollow
Mitchell Gap
High Dewey Mountain
SAILOR
OZARK NATIONAL FOREST
Branch
Baldwin
Cooper Hollow
Cooper Mountain
Gregory
Lumpkin Cr
Creek
Snow Br
RIDGE
NATIONAL FOREST BOUNDARY
Dutton
East Prong
Morgan Hollow
Issac Knob
1 MILE
1 KILOMETER
SCALE 1:20 000

MADISON COUNTY, ARKANSAS — SHEET NUMBER 43


R. 26 W.
R. 25 W.
(Joins sheet 39)
(Joins sheet 44)
(Joins sheet 47)
43
N
Wist
Hollow
Mitchell
Gap
River
NATIONAL
FOREST
Dutton
White
River
Pettigrew
Morgan
FOREST
RIDGE
East
Prong
Hollow
Garrett
Issac
Knob
Kelly
Gap
Mountain
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 40)
R. 25 W. | R. 24 W.
(Joins sheet 43)
(Joins sheet 48)
White
River
Beech
Hurricane
Creek
Little
Creek
Mulberry
Muddy Gap
OZARK
NATIONAL
FOREST
34
35
36
31
32
2
1
6
5
4
3
10
11
12
7
8
9
14
13
18
17
16

MADISON COUNTY, ARKANSAS — SHEET NUMBER 44

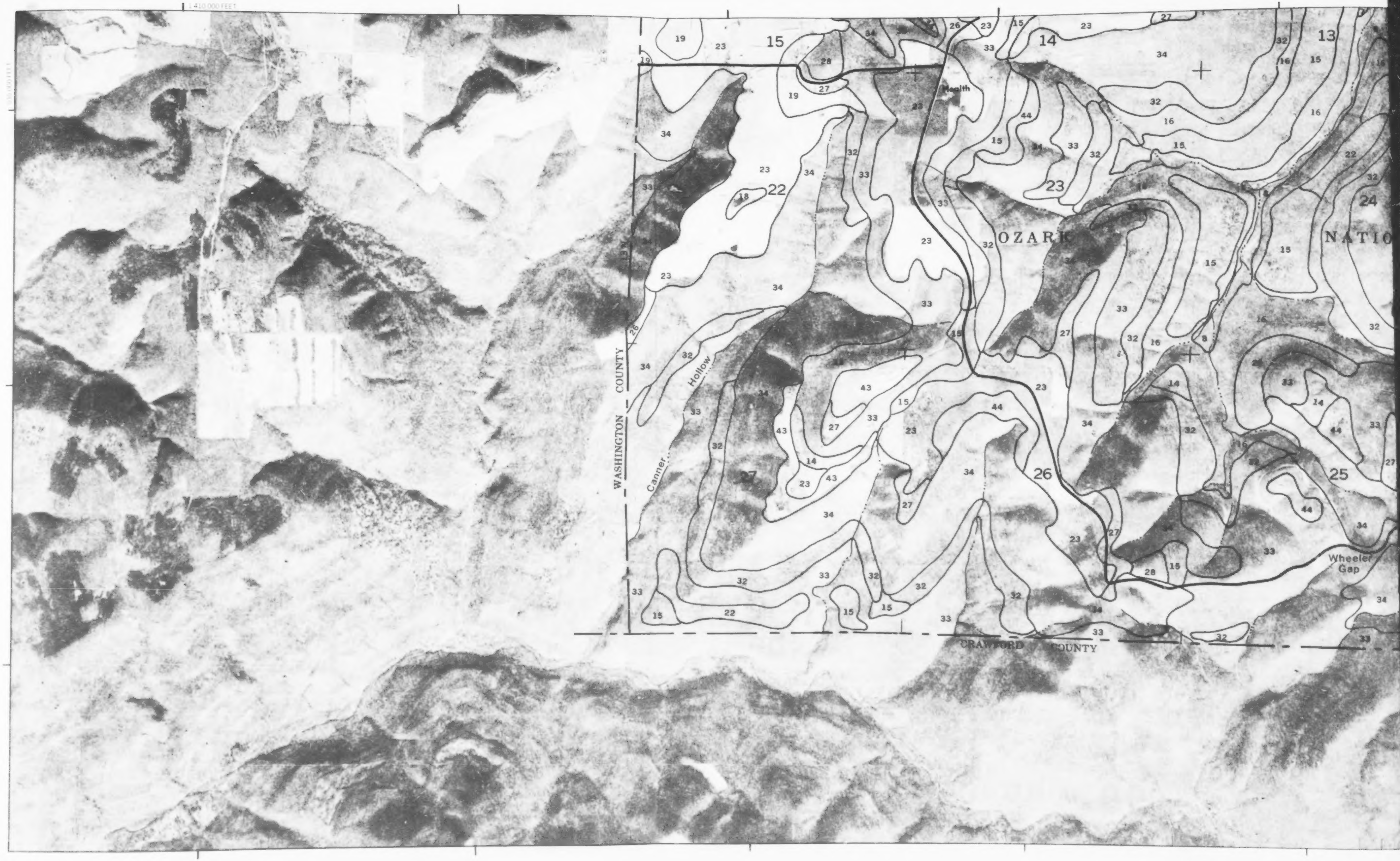

R. 25 W.
R. 24 W.
1 555 000 FEET
NATIONAL FOREST
Mulberry Creek
Little Creek
Creek
NEWTON COUNTY
T. 13 N.
T. 14 N.
1
3/4
1/2
1/4
0
1 Mile

MADISON COUNTY, ARKANSAS NO. 44

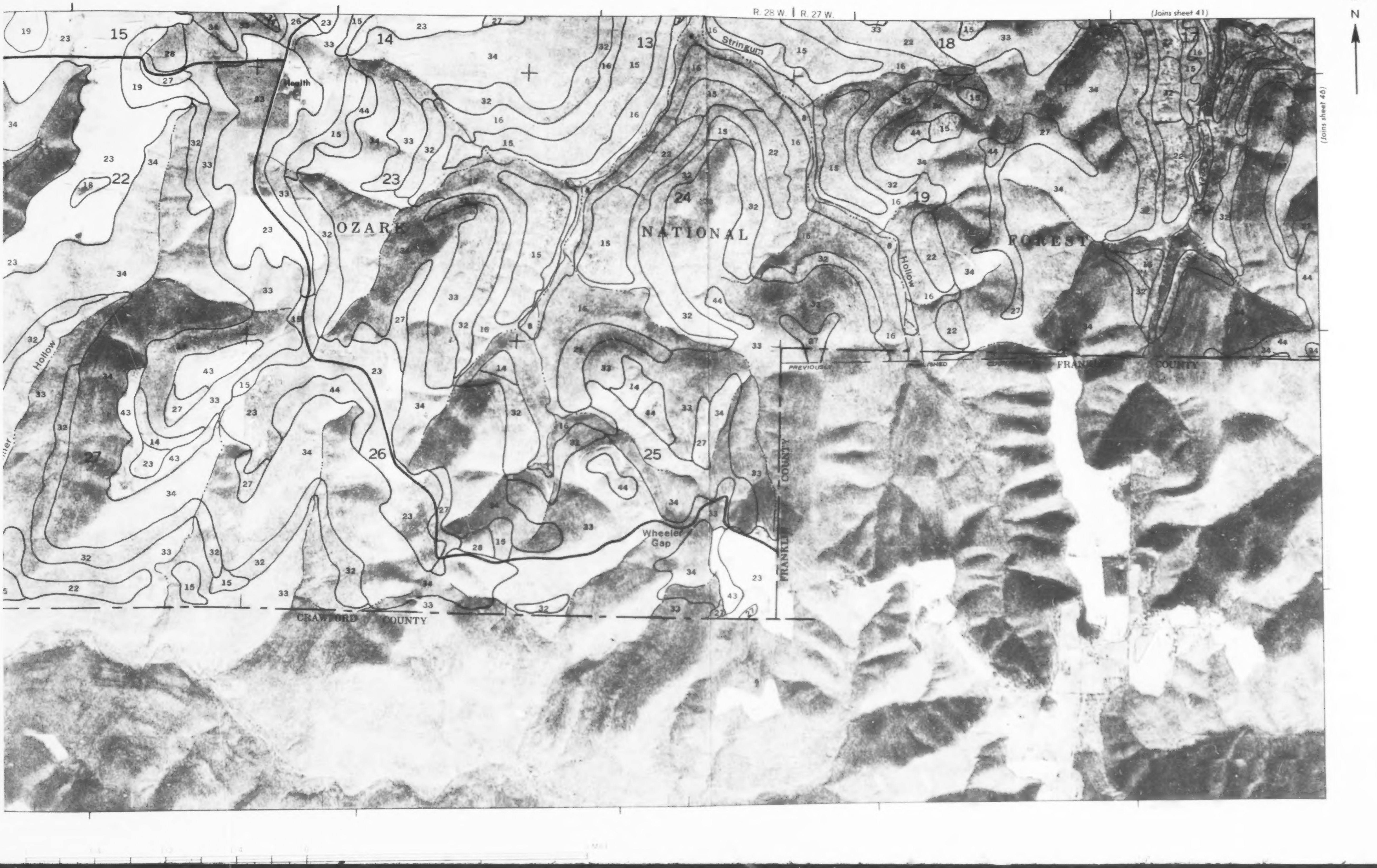
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating

shown are approximately positioned

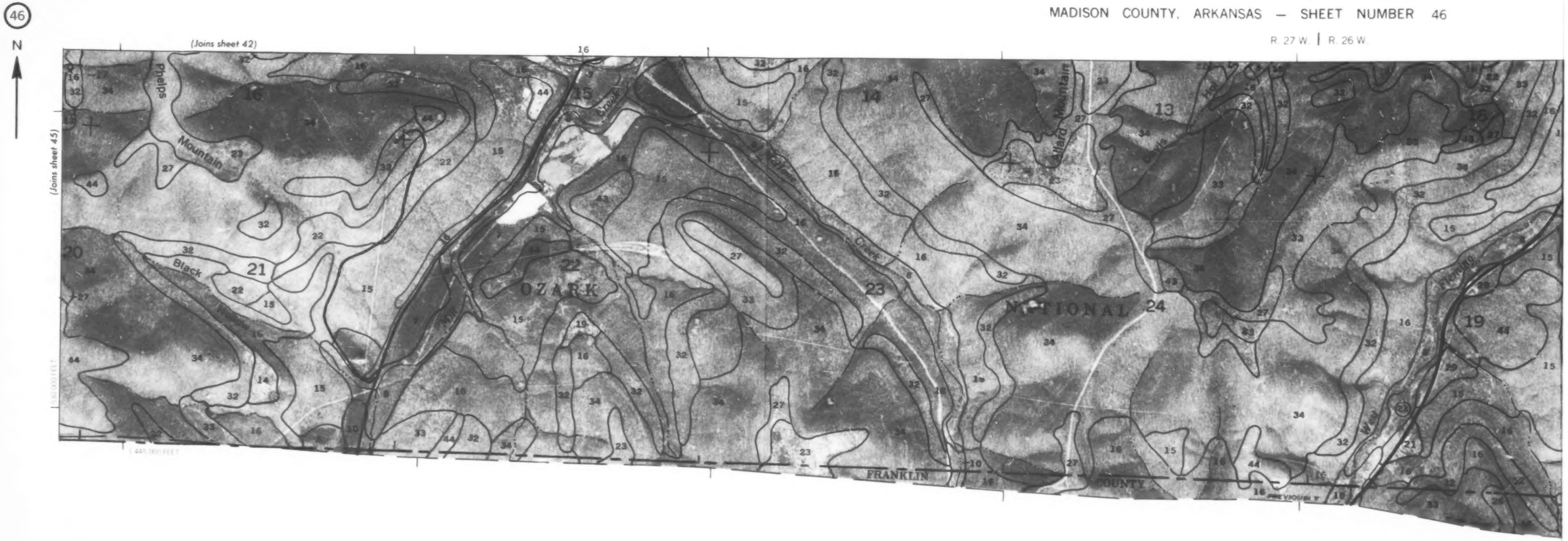
MADISON COUNTY, ARKANSAS NO. 45

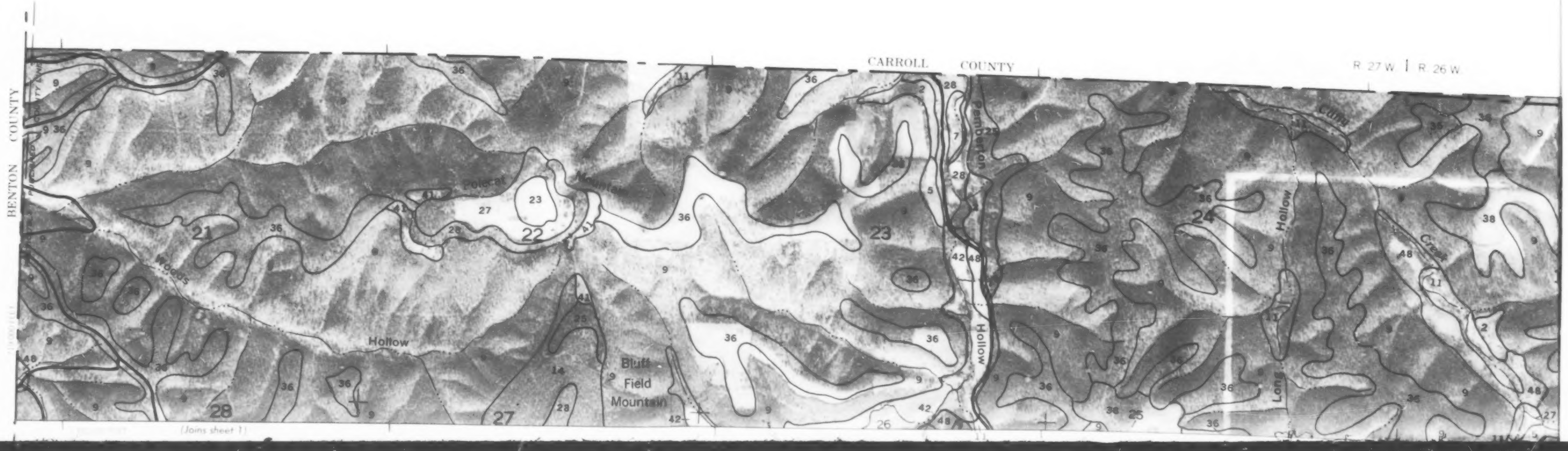

1 410 000 FEET
WASHINGTON COUNTY
CRAWFORD COUNTY
OZARK
NATIO
Canner Hollow
Wheeler Gap
Health
15
14
13
22
23
24
25
26
27
19
28
32
33
34
16
43
44
8
18

MADISON COUNTY, ARKANSAS — SHEET NUMBER 45

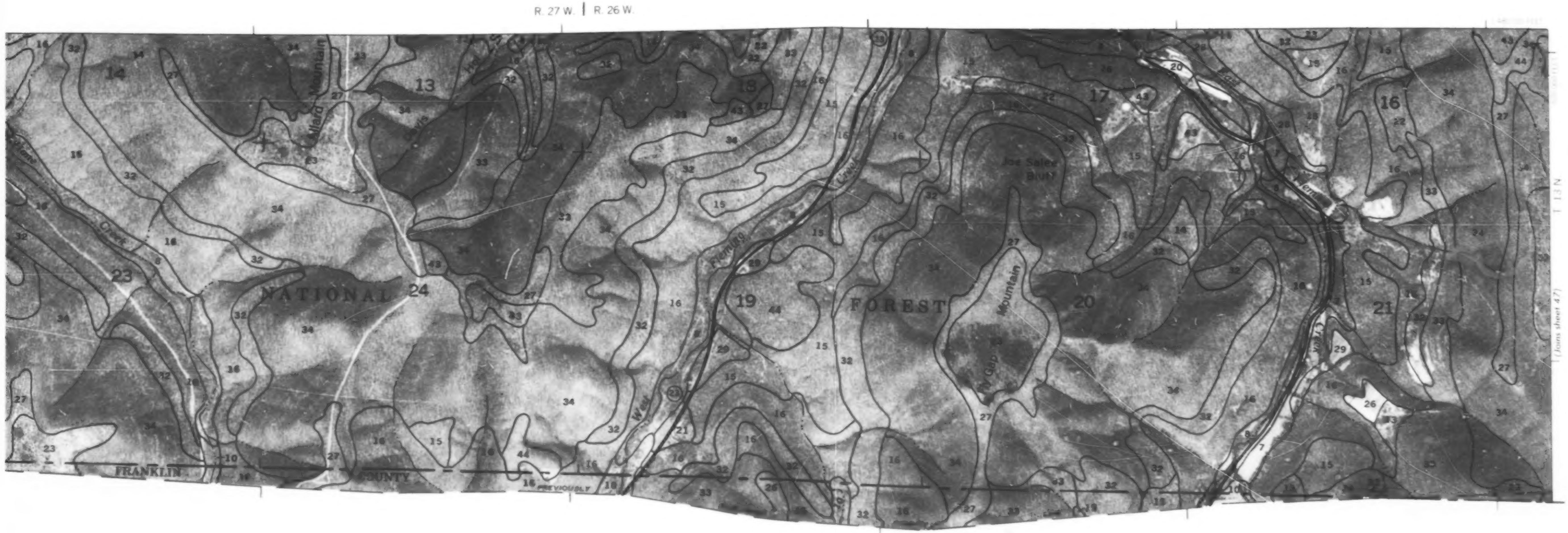

45
N
R. 28 W.
R. 27 W.
(Joins sheet 41)
(Joins sheet 46)
OZARK
NATIONAL
FOREST
Stringum
Hollow
Hollow
Health
Wheeler Gap
FRANKLIN COUNTY
FRANKLIN COUNTY
CRAWFORD COUNTY
PREVIOUSLY PUBLISHED
15
14
13
18
22
23
24
19
27
26
25
1 Mile

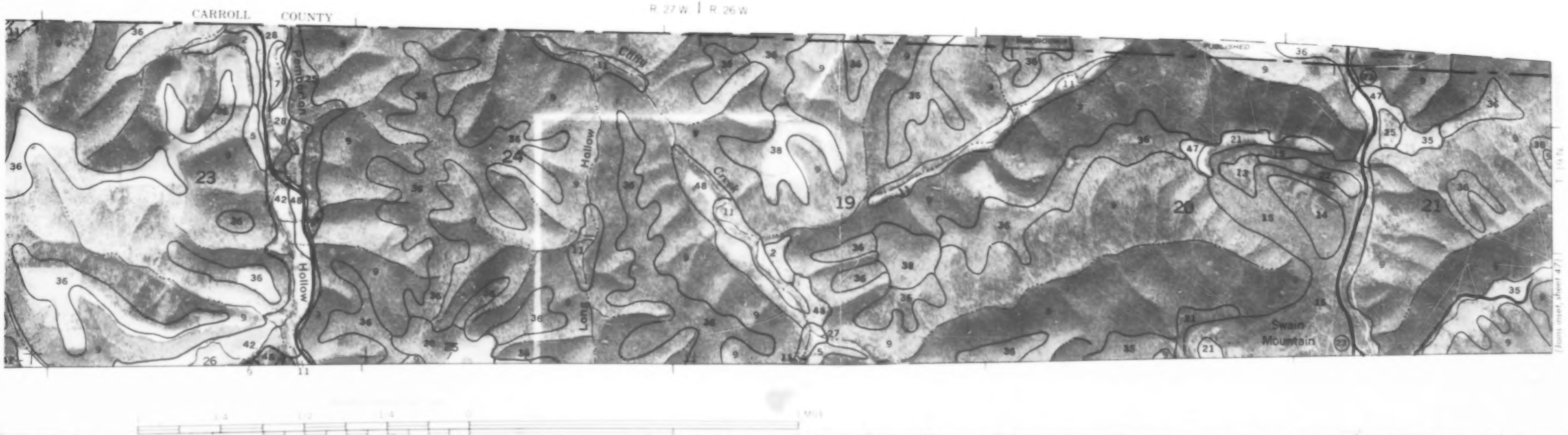
MADISON COUNTY, ARKANSAS — SHEET NUMBER 46

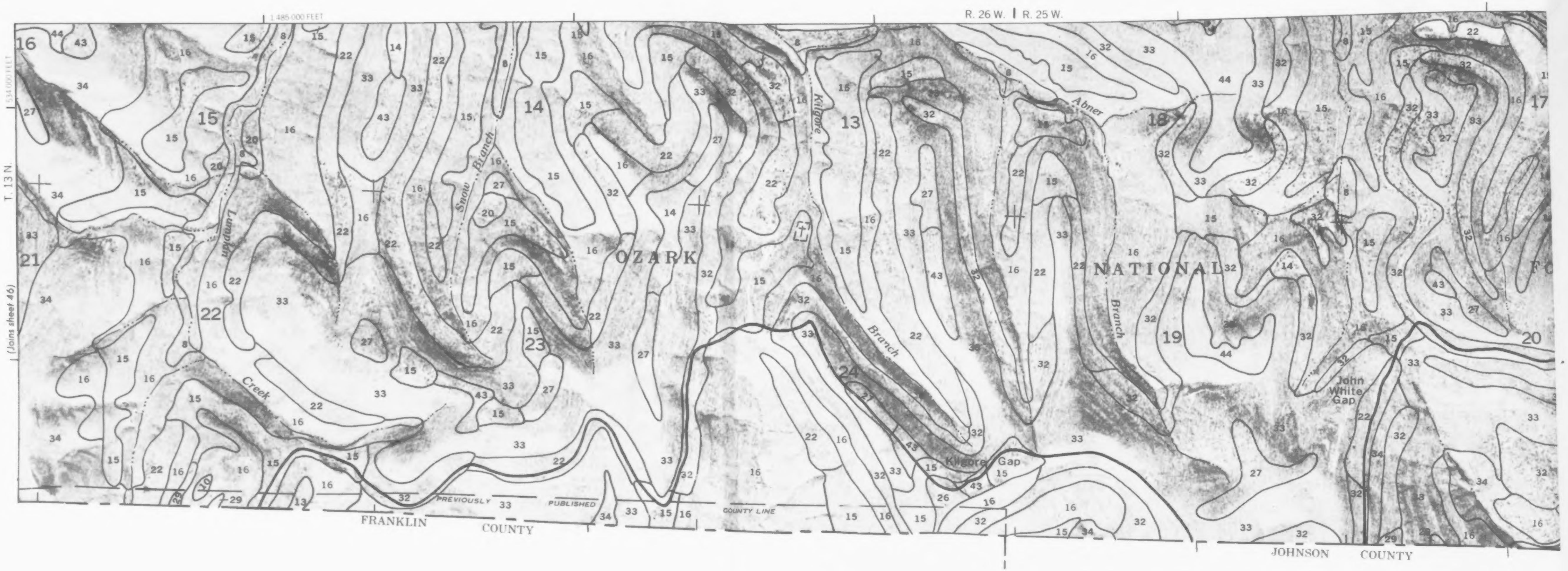

N
R. 27 W. | R. 26 W.
(Joins sheet 42)
(Joins sheet 45)
Phelps
Mountain
Black
OZARK
NATIONAL
Creek
Mill
Mountain
FRANKLIN
COUNTY
445 000 FEET
13
14
15
16
19
20
21
22
23
24

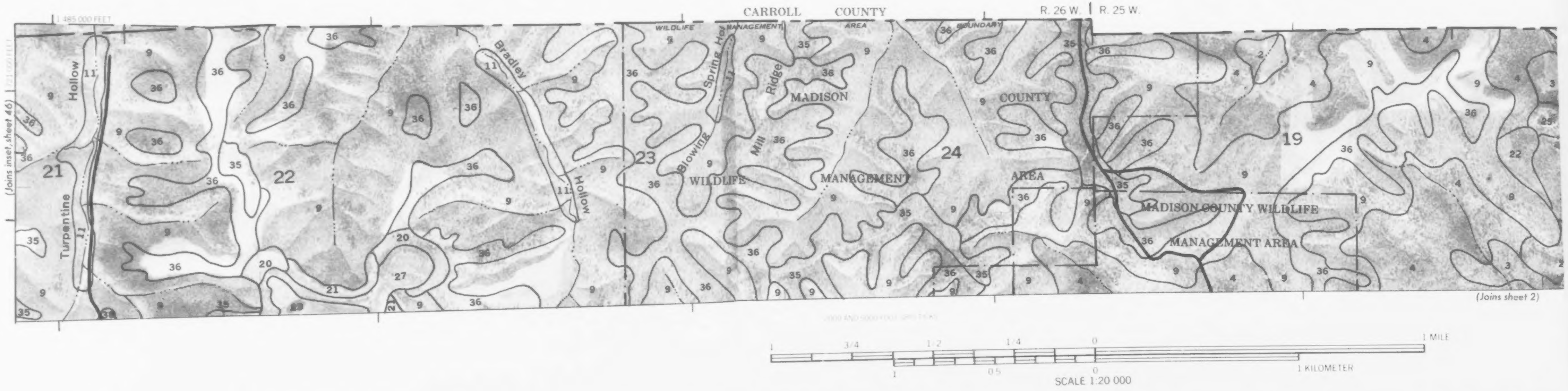

CARROLL
COUNTY
BENTON
COUNTY
R. 27 W. | R. 26 W.
Polecat
Mountain
Woods
Hollow
Bluff
Field
Mountain
Pemberton
Hollow
Long
Hollow
Creek
(Joins sheet 1)
21
22
23
24
25
26
27
28

MADISON COUNTY, ARKANSAS — SHEET NUMBER 46


R. 27 W. | R. 26 W.
NATIONAL
FOREST
FRANKLIN
COUNTY
PREVIOUSLY
Joe Sales Bluff
Mountain
Creek
T. 13 N.
(Joins sheet 47)
14
13
17
16
23
24
19
20
21

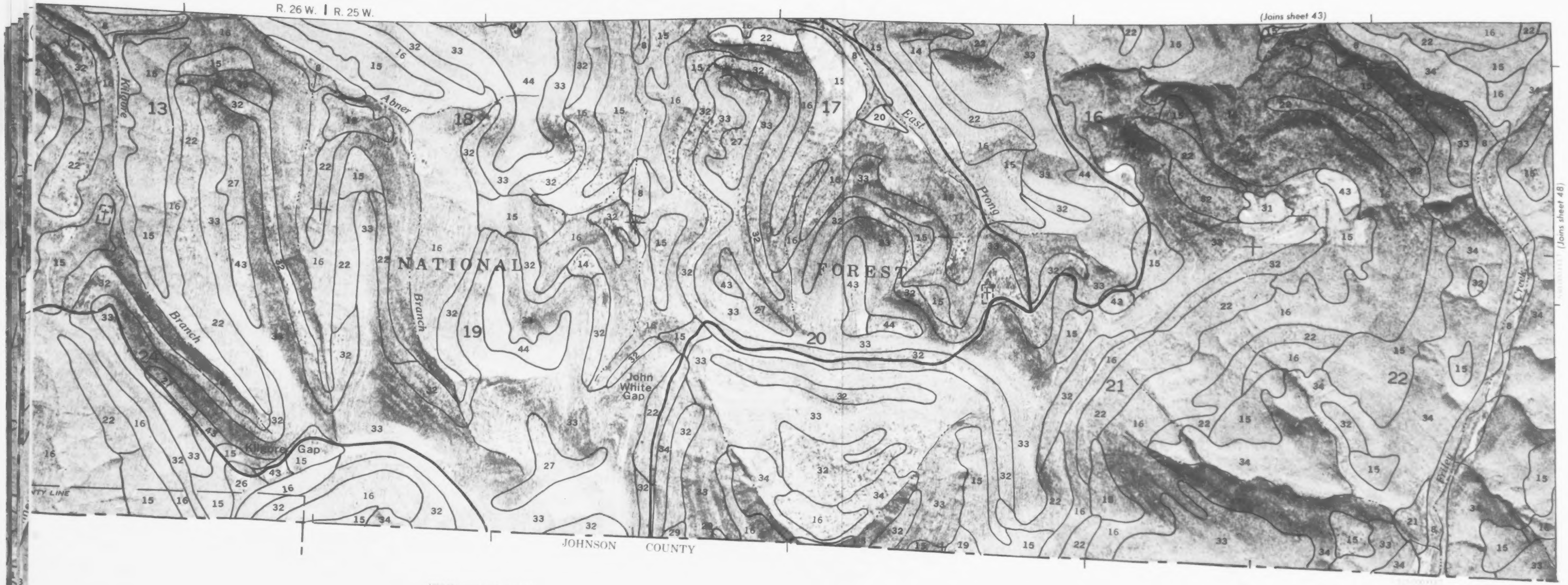

CARROLL
COUNTY
R. 27 W. | R. 26 W.
PUBLISHED
Pemberton
Hollow
Long
Hollow
Cane
Creek
Swain Mountain
T. 14 N.
(Joins inset sheet 47)
23
24
19
20
21
1 Mile

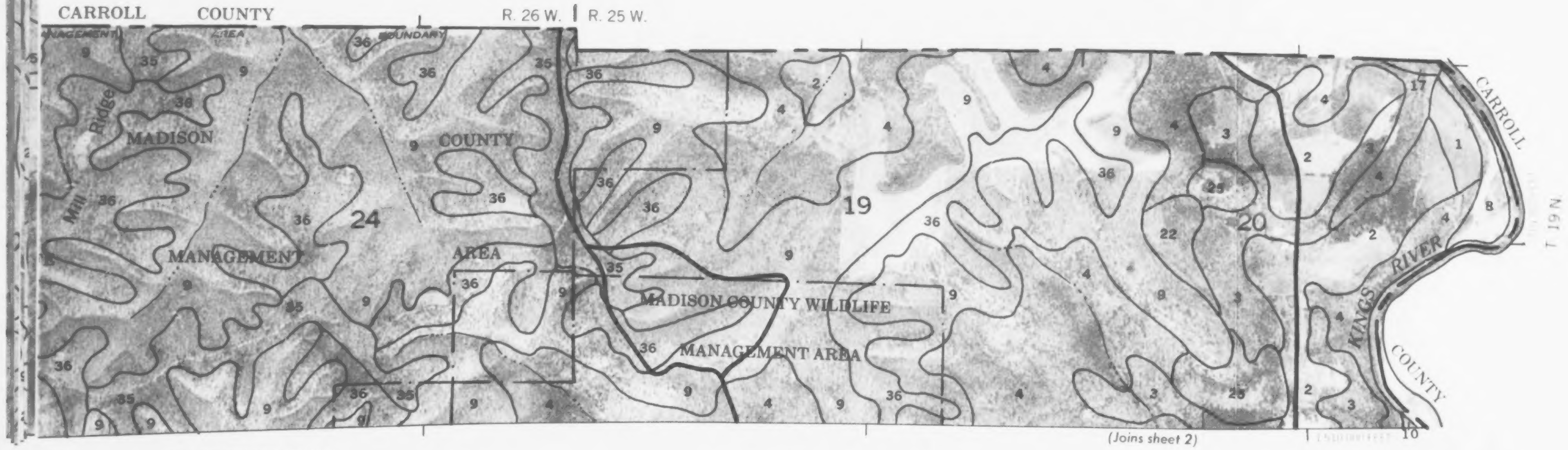

1 485 000 FEET
R. 26 W. | R. 25 W.
T. 13 N.
(Joins sheet 46)
OZARK
NATIONAL
Snow Branch
Lumpkin
Creek
Kilgore
Branch
Abner
Kilgore Gap
John White Gap
PREVIOUSLY PUBLISHED
COUNTY LINE
FRANKLIN COUNTY
JOHNSON COUNTY
14
13
18
17
15
22
23
24
19
20
21


1 485 000 FEET
CARROLL COUNTY
WILDLIFE MANAGEMENT AREA BOUNDARY
R. 26 W. | R. 25 W.
(Joins inset, sheet 46)
Hollow
Turpentine
Bradley Hollow
Blowing Spring Hol
Mill Ridge
MADISON COUNTY
WILDLIFE MANAGEMENT AREA
MADISON COUNTY WILDLIFE MANAGEMENT AREA
21
22
23
24
19
(Joins sheet 2)
1 MILE
3/4
1/2
1/4
0
1
0.5
1 KILOMETER
SCALE 1:20 000

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MADISON COUNTY, ARKANSAS NO. 47

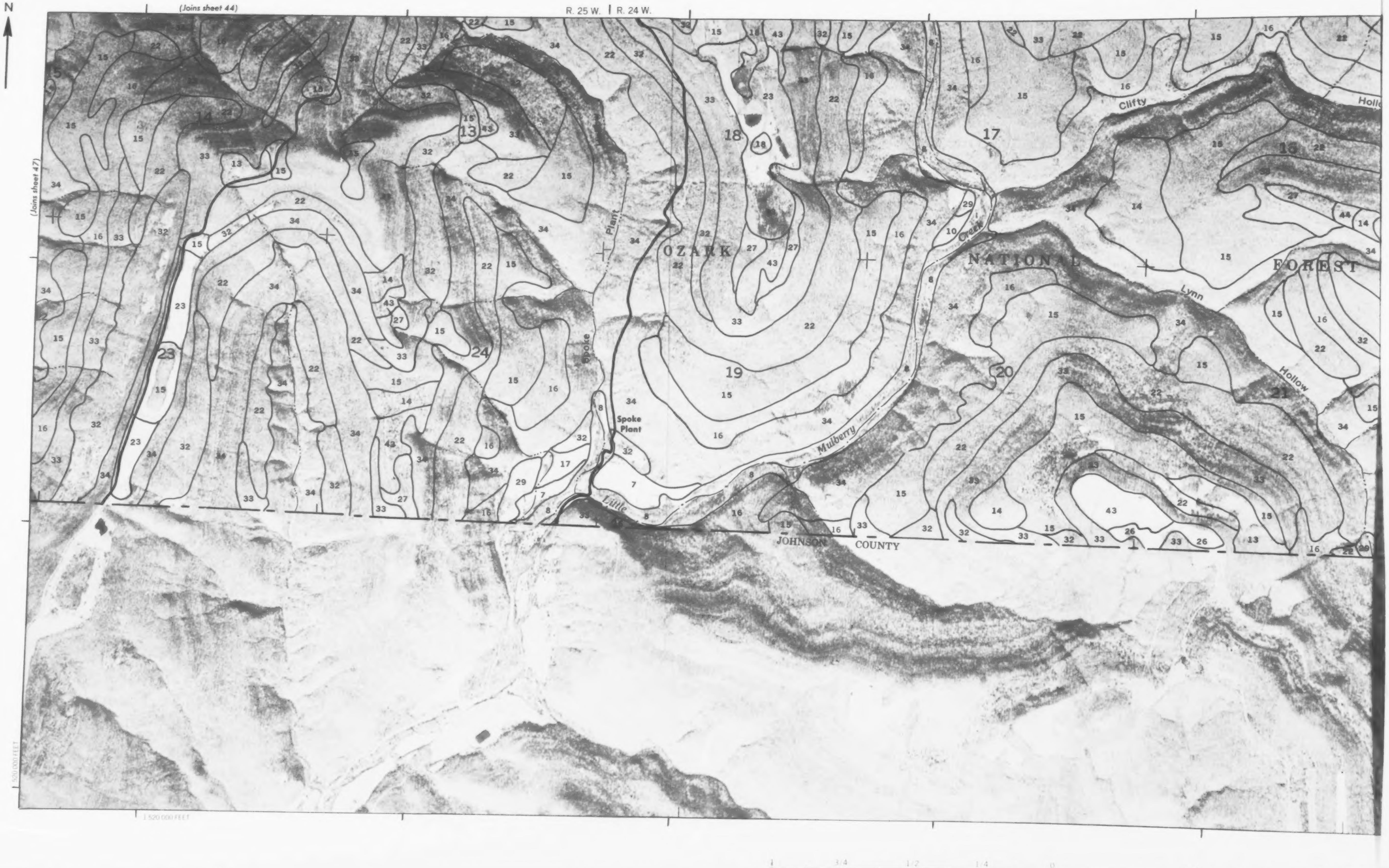

R. 26 W. | R. 25 W.
(Joins sheet 43)
(Joins sheet 48)
N
13
18
17
16
19
20
21
22
24
Kilgore
Abner
East Prong
NATIONAL
FOREST
Branch
John White Gap
Kilgore Gap
Creek
COUNTY LINE
JOHNSON COUNTY
4000 AND 5000 FOOT GRID TICKS


CARROLL COUNTY
R. 26 W. | R. 25 W.
MANAGEMENT AREA BOUNDARY
Mill Ridge
MADISON COUNTY
MANAGEMENT AREA
24
19
20
MADISON COUNTY WILDLIFE MANAGEMENT AREA
KINGS RIVER
CARROLL COUNTY
T. 19 N.
(Joins sheet 2)
2000 AND 5000 FOOT GRID TICKS

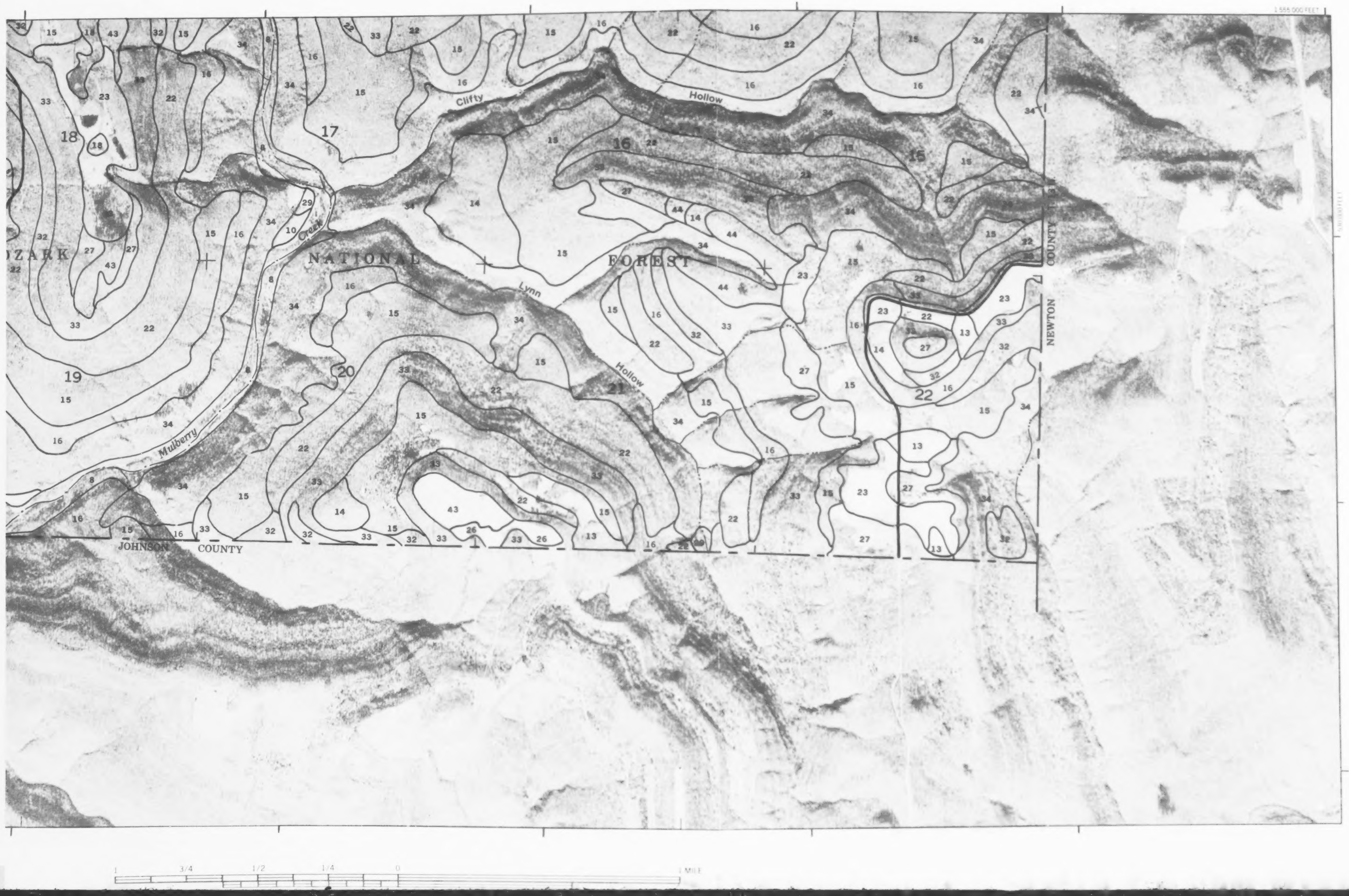
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 44)
R. 25 W.
R. 24 W.
(Joins sheet 47)
OZARK
NATIONAL
FOREST
Clifty
Hollow
Lynn
Hollow
Spoke
Plant
Spoke
Plant
Mulberry
Creek
Little
JOHNSON
COUNTY
13
14
17
18
19
20
21
23
24
1 520 000 FEET
500 000 FEET
1
3/4
1/2
1/4
0

MADISON COUNTY, ARKANSAS — SHEET NUMBER 48


1 555 000 FEET
OZARK
NATIONAL
FOREST
Clifty
Hollow
Lynn
Hollow
Creek
Mulberry
JOHNSON
COUNTY
NEWTON
COUNTY
17
18
19
20
21
16
15
22
1
3/4
1/2
1/4
0
1 MILE

shown are approximately positioned